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WITH THE COÖPERATION OF

E. D. MERRILL, M. S.; F. W. FOXWORTHY, PH. D.
C. B. ROBINSON PH. D.; H. N. WHITFORD, PH. D.

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* Report of the Superintendent of Government Laboratories in the Philippine Islands for the Year Ending September 1, 1903. (Appendix G of the Fourth Annual Report of the Philippine Commission.)

39. Third Annual Report of the Superintendent of the Bureau of Government Laboratories for the Year Ending August 31, 1904.

40. Fourth Annual Report of the Superintendent of the Bureau of Government Laboratories for the Year Ending August 31, 1905.

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VOL. IV APRIL, 1909 No. 1

THE FERNS OF THE MALAY-ASIATIC REGION. PART I.

By EDWIN BINGHAM COPELAND.

(*From the Bureau of Education, Manila, P. I.*)

The fern flora of the Malay Archipelago is the richest in the world, in species, in genera, and in families. In recent geological times this region has evidently been a center for the diffusion of species, in every direction in which no impassable barriers prevent it. The study of this flora has therefore a very special bionomic interest; but a thorough floristic study is an indispensable prerequisite to any valuable bionomic work. I have devoted a number of years to this field, and am presenting this "flora" in the expectation that it will make this work easier for others.

In this Part I, including all familes except *Hymenophyllaceae* and *Polypodiaceae,* the genera are almost all so striking in appearance that the photograph of one species in each will permit their immediate recognition by a beginner. However, the subjects for the photographs have been chosen from species the illustration of which will be useful to specialists in pteridology.

The greater part of the materiál used in this work is in the herbarium of the writer and in that of the Bureau of Science, in Manila. The plants in these families in the Hongkong herbarium were kindly loaned by the Director of that institution, Mr. S. T. Dunn; and the veteran missionary and botanist, Urbain Faurie, of Aomori, Japan, has helped me with his complete material in the same families. Grateful acknowledgment is made to these gentlemen.

While this part is in press, the large volume "Malayan Ferns" by Captain C. R. W. K. van Alderwerelt van Roseburg came to hand. I am fortunately still able to make such corrections in this paper as do not break into paragraphs, and can therefore use van Alderwerelt's previously unpublished information as to the range of various species.

KEY TO THE FAMILIES OF FILICALES.

Sporangium derived from a group of cells, wall more than 1 cell thick (EUSPORANGIATAE).
  Sporangia solitary, marginal on reduced segments ..... 1. *Ophioglossaceae*
  Sporangia in sori, dorsal, on normal fronds ..... 2. *Marattiaceae*
Sporangium derived from a single cell; wall 1 cell thick (LEPTOSPORANGIATAE).
  Spores of two kinds; aquatic plants (HYDROPTERIDINEAE).
    Leaves cruciform ..... 3. *Marsileaceae*
    Leaves not cruciform, plants floating ..... 4. *Salviniaceae*
  Spores of one kind, mostly terrestrial (EUFILICINEAE).
    Leaves with the usual leaf tissues.
      Sporangium opening by a longitudinal slit.
        Annulus rudimentary ..... 5. *Osmundaceae*
        Annulus subapical ..... 6. *Schizaeaceae*
        Annulus medial ..... 7. *Gleicheniaceae*
      Sporangium opening by a more or less transverse slit.
        Annulus oblique.
          Aquatic ..... 8. *Parkeriaceae*
          Not aquatic, rhizome creeping ..... 9. *Matoniaceae*
          Not aquatic, caudex erect, mostly tree ferns ..... 10. *Cyatheaceae*
        Annulus longitudinal, incomplete ..... 12. *Polypodiaceae*
    Leaves without stomata, usually without parenchyma.. 11. *Hymenophyllaceae*

ARTIFICIAL KEY.

Aquatic, leaves cruciform ..... *Marsilea*, p. 12
Aquatic, leaves simple, floating plants.
  Midrib present, but no veinlets ..... *Azolla*, p. 14
  Veinlets present ..... *Salvinia*, p. 14
Aquatic, leaves pinnately compound ..... *Ceratopteris*, p. 26
Terrestrial, stipules present ..... MARATTIACEÆ, p. 8
Terrestrial, stipules wanting.
  Frond forked into a sterile segment and a fertile one arising from it or below it. OPHIOGLOSSACEÆ, p. 3
  Frond not forked into a sterile and a fertile segment.
    Leaves mostly very thin, sori terminal, inclosed by two equal thin valves (HYMENOPHYLLACEÆ).
    Leaves mostly thicker, sori not inclosed by two equal thin valves.
      Rachis scandent, monopodial (dichotomous) ..... *Lygodium*, p. 17
      Frond grass- or rush-like, digitate or dichotomous at top ..... *Schizaea*, p. 20
      Fronds monopodial, pendent ..... *Phanerosorus*, p. 28
      Fronds not monopodial, nor grass-like with digitate or dichotomous apex.
        Frond fan-shaped, with pinnate divisions ..... *Matonia*, p. 27
        Frond not fan-shapped with pinnate divisions.
          Ultimate divisions pinnate, frond equally dichotomous below these. *Gleichenia*, p. 22
Frond not dichotomous and then pinnate.
  Sporangia large, opening by a slit across the apex ..... *Osmunda*, p. 15
  Sporangia not opening by a slit across the apex.
    Tree-ferns with oblique annulus ..... CYATHEACEÆ, p. 28
    Not tree-ferns with oblique annulus.
      Annulus oblique, frond at least tripinnate ..... *Balantium*, p. 61
      Annuls not oblique, or frond but once pinnate (POLYPODIACEÆ).

1. OPHIOGLOSSACEÆ.

Rhizome usually underground, small, usually erect, of very slow growth, producing one or two leaves annually; fronds small or of moderate size, without stipules, straight or folded in vernation (not circinate); fertile segment very contracted, springing from the ventral face of the sterile frond or of its stipe; sporangia large, formed each from a group of superficial cells and having a wall several layers of cells thick, without any annulus.

A small family of three genera. These are perhaps the most primitive living *Pteridophyta*. The origin of the sporangium, the vernation, and the structure of the stomata recall *Anthoceros;* and these characters and the occurrence of collateral bundles with secondary thickening indicate a close affinity to what must have been the ancestors of the flowering plants.

Veins reticulate ..... 1. *Ophioglossum*
Veins free:
  Sterile segment pinnate in plan..... 2. *Botrychium*
  Sterile segment trifid, its divisions sparingly pinnate..... 3. *Helminthostachys*

1. **OPHIOGLOSSUM** Linnaeus.

Sterile segment entire or sparingly forked, with anastomosing veins; fertile segment likewise simple or rarely forked, fleshy, linear; sporangia immersed in the sides of the segment and opening by a slit transverse to it. A genus of at most 43 known species, chiefly tropical.

Fertile and sterile segments separating at or below the base of sterile blade.
  Sterile blade with an apparently stout midrib..... 1. *O. fibrosum*
  Without apparently stout midrib.
    Sterile blade linear or lanceolate.
      Segments separating well above ground..... 2. *O. gramineum*
      Common stipe hardly reaching above ground.
        Fertile segment rising from base of sterile..... 3. *O. japonicum*
        Sterile segment stalked..... 4. *O. braunii*
    Sterile blade ovate or elliptic.
      Base cuneate or truncate..... 5. *O. pedunculosum*
      Base cordate ..... 6. *O. reticulatum*
    Sterile blade obovate..... 7. *O. obovatum*
Fertile segment rising from sterile blade.
  Terrestrial ..... 8. *O. intermedium*
  Epiphytic ..... 9. *O. pendulum*
Sterile blade practically none..... 10. *O. simplex*

1. **Ophioglossum fibrosum** Schum.

Rhizome large and globose with numerous fibrous roots; common stipe very short; sterile segment 4 to 5 cm long, lanceolate or oblong, acute or obtuse, thick and opaque; venation very dense next the costa, giving the appearance of a broad midrib; fertile segment 3 to 5 cm long, on a stipe of 10 to 12 cm; sporangia up to 50 on a side.

Southern India, Sumatra, tropical Africa.

2. **Ophioglossum gramineum** Willd.

Common stipe rising well above the ground; sterile lamina 10 to 15 mm long; 1 to 2 mm broad, fertile segment arising from base of sterile, the spike up to 9 mm long, with 4 to 9 sporangia on a side; whole plant not over 4.5 cm high.

India, New Guinea, western Africa.

3. **Ophioglossum japonicum** Prantl.

Rhizome cylindrical; common stipe hardly reaching above the ground; sterile lamina about 4.5 cm long, lanceolate, somewhat fleshy; fertile segment rising from the base of the sterile, and 3 to 4 times as high, sporangia up to 50 on a side.

Japan.

4. **Ophioglossum braunii** Prantl.

Common stipe not reaching above the ground; sterile blade lanceolate, typically thin but in the only reported collection from this part of the world said to be thicker, free veinlets few, and the midvein not branched; fertile segment arising below the base of the sterile.

Yunnan (?); Cape Verde Islands.

5. **Ophioglossum pedunculosum** Desv. (Plate I, B. C.)

Rhizome cylindrical or globose, with copious fleshy roots; common stipe arising 1 to 5 cm or more above the ground; sterile blade ovate, usually acute, subentire, narrowed abruptly to a cuneate base, commonly 3 to 4 cm long, the extremes in the Philippines being 1 cm and 7 cm; fertile segment arising from the base of the sterile or just below it; stipe of fertile segment 1 to 4 times exceeding the sterile one. A common and exceedingly variable species, which has therefore received many names. I am unable to distinguish *O. timorense* Miq.

Two plants described as varieties of this species by Raciborski are raised to specific rank by van Alderwerelt (p. 774): *O. inconspicuum* of Java and New Guinea, and *O. pumilum* of Java.

Japan to India and New Zealand.

6. **Ophioglossum reticulatum** L.

Similar to *O. pedunculosum,* but the sterile blade cordate above the short cuneate base; a less variable species here, without very small forms.

Luzon, Mount Mariveles; in the tropics from the Carolines eastward to the Mascarenes.

7. **Ophioglossum obovatum** Miq. Ann. Mus. Lugd.-Bat. 4 (1868) 93.

Sterile segment 5 cm long, 12 mm broad, with a stipe one-third as long, oblong-obovate or more rarely broadly obovate, apex broadly rounded,

base gradually narrowed to a broad petiole, subcoriaceous, green, margin crisped when dried, areolæ with a secondary interior network; stipe of fertile segment far exceeding the sterile, commonly 10 cm high, "spike" narrow, 2.5 cm long, mucronate, sporangia 40 on a side.

Timor.

The preceding 7 species constitute with us the subgenus **Eu-ophioglossum**; there is no general agreement as to the limitations of the species in this group. Besides those here enumerated, Christensen cites *O. parvifolium* Grev. & Hook., from Malacca and India; it is not improbably a form of *O. pedunculosum*, as stated by Matsumura and Hayata. There seems to be another species in Mindanao, but my material does not justify describing it. *O. macrorhizum* Kze., a South American plant, has been ascribed doubtfully to the Philippines.

8. **Ophioglossum intermedium** Hooker. (Plate I, A.)

Rhizome terrestrial and on rotten logs; stipe erect, about 10 cm high, merging into the blade; sterile blade about 10 cm high, oblanceolate, entire or lobed near the apex, obtuse, veins reticulate without free included veinlets; fertile segment arising from the sterile and equaling or somewhat overtopping it.

Borneo, Java, Mindoro, New Guinea.

9. **Ophioglossum pendulum** L.

Rhizome epiphytic, giving rise to a number of pendent fronds; stipe up to 10 cm long, merging into the blade; sterile blade 20 to 100 or even 150 cm long, 2 to 6 cm broad, simple or more often forked, usually sinuate, fleshy-coriaceous but drying thin, veins reticulate with large areoles and no included veinlets; fertile segments one or often a pair, springing from below the middle of the sterile blade, short-stalked, with a fleshy spike 3 to 10 cm or more long.

Mauritius to India, Formosa, Yakushima, New South Wales, and Hawaii.

10. **Ophioglossum simplex** Ridley.

Terrestrial, rhizome short and tuberous, with few roots; fertile fronds solitary, or two together, slender, flattened, with a blunt apex, 10 to 20 cm long, 3 mm wide, dark green; sterile division represented by a very small lateral process, or quite absent; fertile portion of frond about 3 cm long, with a stipe of less than this length above the sterile rudiment.

Sumatra, Siak, wet forests on the Kelantan River.

2. **BOTRYCHIUM** Swartz.

Frond pinnate in plan, in most species several times pinnate and deltoid, the fertile segment as much branched as the sterile, or more so; sporangia globose, not immersed, opening by a transverse slit. A genus

of at most 34 known species, cosmopolitan, but with a boreal center of distribution.

Pinnæ flabellate rather than pinnate.
  Sterile and fertile segments separating just below sterile blade..... 1. *B. lunaria*
  Common stalk very short..... 2. *B. simplex*
Fronds at least tripinnatifid.
  Fertile segment arising below the base of the sterile.
    Sterile frond fleshy, typically with a hyaline margin.
      Segments widened on both sides above base..... 3. *B. matricariae*
      Segments not widened on both sides..... 4. *B. obliquum*
    Sterile frond without hyaline margin.
      Frond fleshy ..... 5. *B. ternatum*
      Frond thin, herbaceous.
        Fertile segment arising above middle of the petiole..... 6. *B. daucifolium*
        Fertile segment arising lower down..... 7. *B. japonicum*
  Fertile segment arising from base of sterile..... 8. *B. virginianum*
  Fertile segment arising from rachis of sterile..... 9. *B. lanuginosum*

1. **Botrychium lunaria** (L.) Swtz.

Stipe stout, fleshy, 3 to 10 cm high; sterile segment 2 to 6 cm long, about 2 cm broad, pinnate, rachis flattened rather than winged; pinnae usually equal, broader than long, sessile or nearly so, subcuneate, entire or variously incised on the outer side, fleshy, glabrous, the lowest pair sometimes enlarged and doubly incised; fertile segment arising from (or just below) the base of the sterile, its stalk 3 to 7 cm long, the blade (panicle) lanceolate deltoid, pinnæ stalked, the lowest pair pinnate.

Himalayas to Europe and Siberia; North America, Patagonia, New Zealand, southern Australia.

2. **Botrychium simplex** Hitchc.

Like *B. Lunaria*, but decidedly smaller and more simple, and the stalks of the two segments separating well below the base of the sterile one.

Japan, North America, northern Europe.

3. **Botrychium matricariae** (Schrank) Spr.

Stipe separating less than halfway up to the base of the sterile segment; young frond hairy; sterile blade deltoid, in Chinese specimens 5 cm long, 4 cm broad, tripinnate, the lobes small, oval, widening abruptly on both sides above the base, or even cordate, margin hyaline because of thick epidermis; veins spreading above the base; stipe of the ample fertile segment 10 cm long. The plant grows larger elsewhere.

Central China, northern Asia, Europe and America.

4. **Botrychium obliquum** Mühl.

Like the preceding, but the common stipe very short—only 1 cm long in Chinese specimens—the sterile segments broader than long, its ultimate divisions more ample (i. e., less cut), and oblique, usually not much widened above the base on the upper side, and the veins less spreading.

Su-Chuen; eastern North America.

5. **Botrychium ternatum** (Thunb.) Swartz.

Similar to the two preceding species but thinner in texture, without a hyaline border, and with the margin finely toothed; fronds about 10 cm broad, nearly as long, usually quinquepinnatifid: total height of fertile segment 30 cm.

Japan to the Himalayas.

6. **Botrychium daucifolium** Wall.

Axes permanently more or less hairy; common stipe 10 to 17 cm high, fleshy, special stipe of sterile segment 2 to 5 cm long, blade 10 to 30 cm each way, deltoid, tripinnatifid, or sometimes tripinnate; segments lanceolate-oblong, 7 mm more or less broad, sharply irregularly toothed, herbaceous; fertile segments equaling or exceeding the sterile.

India to Java, Mindanao, and Negros.

7. **Botrychium japonicum** (Prantl) Und. (Plate II.)

Very like *B. daucifolium,* the stipe forking about halfway from the base of the sterile blade to the stem, the sterile margin more finely and regularly toothed, and the fertile segment far overtopping the sterile.

Japan.

8. **Botrychium virginianum** (L.) Swartz.

Mature frond practically glabrous, stipe about 20 cm high; sterile segment deltoid, 15–30 cm each way, usually quadripinnatifid and the larger lobes then incised at the apex, with sharp uniform teeth about 0.7 mm broad, herbaceous or membranaceous; fertile segment ample, arising from the base of the sterile, and its stipe usually surpassing the latter.

Yunnan and the Himalayas, Japan, Europe, America south to Brazil.

Botrychium strictum Underw. is a Japanese plant with very strict fertile segment, otherwise essentially like *B. virginianum.*

9. **Botrychium lanuginosum** Wall.

Similar to *B. virginianum,* but the main axes permanently pubescent, the texture not so thin, the secondary or tertiary pinnules more flabellate, and the fertile segment arising from the rachis of the sterile and the whole fertile segment usually not equaling the sterile.

Following most recent authors, I have split the species in this genus more finely than I am at all sure is justified; but the last two are certainly distinct.

India, Ceylon, Luzon.

3. HELMINTHOSTACHYS Kaulfuss.

Sterile segment trifid, the three divisions pinnatifid into a few large lobes, veins curved, free; fertile segment erect from the base of the sterile, stalked, very compact, with very short, close branches; sporangium opening by a longitudinal slit. A single species.

Helminthostachys zeylanica (L.) Hooker. (Plate III.)

Rhizome stout, creeping underground; stipes 20 to 35 cm high; sterile segment 18 to 35 cm each way, cut to the base into 3 parts each of which is pinnatifid or pinnate with 1 to 5 pinnæ, which are lanceolate, 2 to 3 cm broad, herbaceous, entire or irregularly sinuate-toothed; stipe of fertile segment about 10 cm high, the spike-like panicle rather shorter.

India to New Caledonia and northern Australia, northward to Formosa.

2. MARATTIACEÆ.

Stem usually large and globose, rarely creeping; fronds circinate in vernation, provided with persistent, more or less fleshy stipules; sori borne on the backs of veins; sporangia large, formed from a group of cells, with a wall more than one cell thick, opening by a longitudinal slit (which rarely shortens to a pore).

A small and isolated family of ferns of striking aspect, including only *Danaea*, of tropical America, and the following five genera:

Sporangia of each sorus not fused together ..... (*Angiopterideae*)
  Fronds at least bipinnate ..... 1. *Angiopteris*
  Fronds simply pinnate.
    Sori on the specialized border of the pinna ..... 2. *Macroglossum*
    Sori midway between costa and margin ..... 3. *Archangiopteris*
Sporangia in each sorus fused together.
  Sori elongate, veins free ..... 4. *Marattia*
  Sori round, veins anastomosing ..... 5. *Christensenia*

ANGIOPTERIS Hoffmann.

Very large ferns with thick, globose, or rarely trunk-like stems, covered with leaf-scars and large, fleshy stipules; stipe stout, with an enlarged pulvinus at the base; frond usually bipinnate, rarely more divided, pinnæ attached to rachis by pulvini; sori marginal or submarginal; sporangia usually 6 to 14, at most about 20, in contact but not fused into a synangium.

A genus of majestic ferns, most abundant in the Malay region, extending to Polynesia, the Himalaya, and tropical Africa. Hooker and Baker, and most other recent writers reduce all to a single species; at the other extreme is the monograph of De Vriese & Hartig, describing 60 species. The number of tenable species is certainly large, but the task of determining which of De Vriese & Hartig's species are such, and of describing not a few others, must be left for another monographer.

I give separate mention here only to the Philippine species recently distinguished by Christ.

Angiopteris evecta (Forst.) Hoffm.

". . . Pinnæ opposite, oblong, with linear-acuminate apex, serrate, sori in a continuous submarginal series." Between the real veinlets are hyaline pseudo-veins of sclerenchyma, recurrent from the margin almost to the costa; up to 20 sporangia in a sorus.

Tahiti; and commonly treated as covering the whole range of the genus, and including all the forms.

Angiopteris augustifolia Presl is the commonest Philippine species. Fronds up to 5 m long, the pinnules green on both surfaces, typically about 13 cm long, less than 1 cm broad, apex finely serrate; recurrent veinlets evident; sori of 5 or 6 sporangia. *A. caudata* de Vr., does not seem to be more than a form of this, with especially pubescent axes.

Angiopteris pruinosa Kze. (as construed by Christ) is a beautiful plant with fronds dark green above and bluish-white beneath, sori of about 8 sporangia close to the margin, and the fine apex obscurely toothed, the base not cordate. It is found in the Visayas and north to central Luzon; it does not seem to me identical with the Javan plant of Kunze.

Angiopteris similis Presl, described from Java and recently found in Mindanao, has pinnules up to 18 cm long and 21 mm broad, serrate only on the sterile tip, pale green beneath, with very fine recurrent veinlets and dark brown sori.

Angiopteris cartilagidens Christ (Plate IV) is a Benguet plant, with the pinnules everywhere prominently and usually very sharply toothed, recurrent veinlets conspicuous but short, and sori of 8 to 12 sporangia well inside the margin.

A. crassipes Wall. is an example of the species without recurrent veinlets. It extends from Nepal and Burma to Japan.

2. MACROGLOSSUM Copeland.

Caudex globose; fronds very large, simply pinnate; recurrent veinlets none; sori about 40; sporangia borne on the specialized, convex margin of the pinnæ. A single species.

Macroglossum alidae Copel. Philip. Journ. Sci. Bot. 3 (1908) 343. (Plate V.)

Fronds suberect, about 3 m high; pinnae attached to rachis by a pulvinus, up to 50 cm long, 6 cm wide, abruptly narrowed to the caudate tip, base rounded, coriaceous, glabrous.

Borneo (Sarawak, Bidi).

3. ARCHANGIOPTERIS Christ et Gies.

Frond simply pinnate, pinnæ with swollen pulvini, few; veins free; sori long, midway between costa and margin; sporangia very small (for this family) and numerous; scales of the indusium persisting as a white line along the middle of each sorus. A single species.

Archangiopteris henryi Christ et Gies. (Plate VI.)

Stipe and stalks of pinnæ finely scaly; pinnæ 5 to 12, stalked above the pulvini, about 20 cm long by 4 cm broad, acuminate, serrate toward the apex, glabrous, herbaceous; sori on most veins except at base and apex of pinna; sporangia up to 160 in a sorus.

Yunnan, in forest, alt. 1,500 m.

4. **MARATTIA** Swartz.

Fronds large, at least bipinnate; pinnæ attached by pulvini; sori below the apices of the free veins, in a row parallel to each margin, the sporangia of each sorus fused together forming a synangium. Christensen recognizes 28 species, in the tropics of both hemispheres and south to the Cape of Good Hope. Our species are too near together.

Synangia usually of 8 or less pairs of sporangia.
- Main rachis smooth.
  - Pinnules broadly lanceolate, acuminate ..... 1. *M. fraxinea*
  - Pinnules narrowly lanceolate, caudate ..... 2. *M. pellucida*
- Main rachis rough ..... 3. *M. sambucina*

Synangia usually of 10 or more pairs of sporangia.
- Coarsely serrate ..... 4. *M. silvatica*
- Obscurely serrate, except at apex ..... 5. *M. ternatea*

1. **Marattia fraxinea** Smith.

The original plant, from Bourbon, has bipinnate fronds, naked axes, almost sessile pinnules 5 to 8 cm long, serrate, lanceolate, acuminate; sori submarginal, sporangia about 6 on each side.

Various modern writers have included under this name all the related forms, of Malaya, Asia, Africa, and tropical Australia. I mention here those regarded as distinct by Diels, Christ or Christensen.

2. **Marattia pellucida** Presl.

Similar to *M. fraxinea,* but the pinnules narrower and longer (10 cm long), decidedly caudate, pale beneath, the sori shorter (usually about 1 mm long). The two species should probably be united; *M. vestita* Christ is probably identical with *M. pellucida.*

Philippines; New Caledonia.

3. **Marattia sambucina** Bl.

Main rachis rough, rachises of pinnæ winged; pinnules sessile, hardly 6 cm long, oblong-lanceolate, sharply serrate with appressed teeth; veinlets simple; sori two-fifths of the way from the margin to the costa; sporangia 8, more or less, on a side.

Java, Celebes; Luzon, *teste* Christ.

4. **Marattia silvatica** Blume.

Described as differing from *M. sambucina* in being coarsely serrate and tripinnate. The Luzon plant referred here is very coarsely serrate, sometimes tripinnate but not normally so, has pinnules up to 9 cm long, usually stalked, and large synangia of 12 or more pairs of synangia.

Java, New Guinea; Luzon.

5. **Marattia ternatea** de Vriese. (Plate VII.)

Pinnules 10 to 20 cm long, 1.5 to 2.5 cm wide, abruptly narrowed at the base, margin obscurely serrate and usually deflexed, more sharply serrate at the apex, texture coriaceous; sori remote from the margin, 3 mm long; sporangia about 15 pairs.

Moluccas, Luzon.

5. CHRISTENSENIA Maxon. (*Kaulfussia* Bl.)

Rhizome creeping, fleshy; fronds simple or palmate; veinlets anastomosing but without free included veinlets; sori irregularly scattered, round, the sporangia fused into synangia. Usually treated as a single species.

Christensenia aesculifolia (Bl.) Maxon.

Stipe 20 to 45 cm high; leaflets 3 to 5, stalked or the lateral ones sessile, middle one the largest, 22 to 40 cm long. Eight to 12 cm broad; synangia of 10 to 15 sporangia.

Malaya to northern India.

Christensenia cumingiana Christ Philip. Journ. Sci. Bot. 2 (1907) 186. (Plate VIII.)

Stipe up to 17 cm high; frond most often simple, and up to 16 cm long and 10 cm wide, cordate, obtuse; sometimes with three leaflets, the middle one not over 15 cm long, sometimes whitish beneath. Sori of 7 to 15 sporangia. Hardly distinct from *C. aesculifolia*.

Mindanao, Negros, Luzon.

HYDROPTERIDINEÆ.

Spores of two kinds in distinct sporangia: macrosporangia, each containing 1 macrospore in which the female prothallium develops; and microsporangia, each containing numerous microspores which develop the male prothallia; sporangia borne in inclosed sori, close to the stem, on very reduced leaves or parts of leaves. Aquatic plants, very distinct in appearance from other ferns.

3. MARSILEACEÆ.

Aquatics with stems creeping on the bottom and leaves which are without blade, or with blades floating on the surface or rising above it, circinate in vernation (like the true ferns); macrospores and microspores borne in the same sori.

Three genera—*Pilularia*, whose leaves are destitute of lamina, wanting in this part of the world; *Regnellidium*, with one Brazilian species; and the following:

MARSILEA Linnaeus.

Normal leaves long-stalked, the blade cruciform. Fifty-six recognized species, in tropical, subtropical and temperate countries. The species vary exceedingly with the habitat and those listed here are probably not all distinct.

Pedicels branched or clustered.
- Pedicel adnate to base of stipe ..... 1. *M. quadrifolia*
- Pedicel not adnate to base of stipe.
  - Pedicel longer than the fruit.
    - Three fruits at the base of each leaf ..... 2. *M. minuta*
    - Two fruits at the base of each leaf.
      - Fruit longer than broad, 3 mm long ..... 3. *M. crenata*
      - Fruit as broad as long, very small ..... 4. *M. brachycarpa*
  - Pedicel shorter than the fruit ..... 5. *M. brachypus*

Pedicels not branched, one at base of each leaf.
- Leaves without pellucid streaks.
  - Sporocarps nearly round, densely silky ..... 6. *M. condensata*
  - Sporocarps nearly square, glabrescent ..... 7. *M. quadrata*
- Leaves with pellucid streaks ..... 8. *M. coromandelica*

1. **Marsilea quadrifolia** L.

Rhizome wide-creeping under water; stipe 8–15 cm long; leaflets obdeltoid, 15 mm more or less long, entire, outer side rounded, glabrous; pedicels in all 15 to 30 mm long, attached halfway more or less to the stipe, forked above this and bearing 2 to 4 sporocarps; sporocarps 3 to 4 mm long, round-oblong, glabrescent, not bordered, with two minute basal teeth; sori 16 to 20 in each sporocarp.

Europe to northern India and Japan; Connecticut.

2. **Marsilea minuta** L.

Stipe 5 cm more or less high; leaflets cuneate-obdeltoid, glabrous or nearly so, 1 cm more or less long, outer edge toothed or almost entire; pedicels 3 to 5 mm high, usually 3 together, distinct unless at the very base; sporocarps about 3 mm long, not quite so broad, with distinct border and ribs, and two basal teeth of which the lower is obscure, silky when young, but more or less glabrous at maturity.

India, Java.

3. **Marsilea crenata** Presl. (Plate IX.)

Stipes 10 cm more or less high, leaflets 12 to 18 mm long, or much smaller when terrestrial, glabrous; sporocarps normally 2, but one of these sometimes abortive, and at the base of several clustered, upper tooth sharp and prominent, margin not well developed, and ribs none; otherwise like *M. minuta*. *M. Mearnsii* Christ in Philip. Journ. Sci. Bot. **3** (1908) 276, is exactly this species; both Presl and Christ mention pellucid streaks, but I can not see them.

Philippines, from Ilocos, Luzon, to Davao.

4. **Marsilea brachycarpa** A. Br.

Leaflets minute, incised, firm in texture; sporocarps very small, as broad as long, bordered but not ribbed, with only three sori on each side; otherwise like the preceding species.

Pegu.

5. **Marsilea brachypus** A. Br.

Leaves silky; pedicles shorter than the fruit, 2 or 3 together; sporocarps silky at maturity, ribbed.

Neilgherries.

M. gracilenta A. Br., from the Concan is like *M. brachypus*, but with less silky leaves, and without visible ribs on the sporocarps.

All of the preceding plants except *M. quadrifolia* seem closely related, and are united under *M. minuta* by Baker.

6. **Marsilea condensata** Baker.

"Subterrestrial, densely tufted; stipes 12 to 36 mm long; leaflets triangular, firm in texture, thinly silky, 6 to 8 mm long, crenate on the outer edge; pedicels in a tuft with the leaves, free to the base, 3 to 6 mm long, stiffly erect, adnate to the whole base of the sporocarp; sporocarp horizontal, suborbicular, densely silky, 3 mm long; basal teeth none or very obscure; sori about 10 in all."

India (Scinde).

7. **Marsilea quadrata** A. Br.

Similar to *M. condensata,* but the leaves slightly larger; pedicels 6 to 8 cm long; sporocarps nearly square, glabrescent, 2 mm long, basal teeth distinct, the upper one prominent, sori 5 or 6 in all.

Borneo.

8. **Marsilea coromandelica** Burm.

A small plant, aquatic or subterrestrial, glabrous throughout; stipe up to 7 cm long, leaflets 2 to 8 mm long, entire, with false veinlets of sclerenchyma showing as hyaline streaks between the real veinlets; pedicels 12 to 18 mm long, free, inserted in the middle of the case of the sporocarp; sporocarp oblong, erect, 4 mm long, bordered and ribbed, teeth distinct, sori 4 to 6 on a side.

India.

4. SALVINIACEÆ.

Small plants, floating on the water; fronds folded in the bud, simple; macrospores and microspores in separate sori. Two genera.

Roots none, normal leaves not lobed ..... 1. *Salvinia*
Roots present, leaves lobed ..... 2. *Azolla*

1. **SALVINIA** (Micheli) Adanson.

Leaves borne in whorls of 3, of which two are normal undivided leaves, borne on the dorsal side, and the other, ventral, one, called the "water-leaf" is dissected, metamorphosed to replace the roots, which are wanting; normal frond with costa and veinlets; sori borne on the basal segments of the water-leaves. Thirteen species, chiefly tropical.

Leaves horizontal, flat, oblong..... 1. *S. natans*
Leaves suberect, wider than long..... 2. *S. cucullata*

1. **Salvinia natans** (L.) All. (Plate X, A.)

Fronds stalked, horizontal, oblong, about 1 cm long, half as broad, rounded at both ends or the base cordate, veinlets 17 to 20 on a side, each with 6 to 8 tufts of fine bristles on the upper surface; nether surface and stem brownish-pubescent.

Plains of India, China south to Fokien, Japan; northern Asia and Europe.

2. **Salvinia cucullata** Roxb.

Fronds sessile, congested, nearly or quite erect, with inflexed margins, 12 to 15 mm broad, not so long; venation lax, veins 10 to 12 on a side; upper surface bearing minute papillæ, nether surface nearly naked.

India; western Australia.

2. **AZOLLA** Lamarck.

Fronds very small, borne in two dorsal rows, deeply bilobed, each lobe with a midrib but no veinlets; fine roots borne on the under side of the stem. Five species.

Azolla africana Desv. (Plate X, B.)

Plant 1 cm more or less long and wide, branching freely and rather irregularly; leaf-lobes obovate, rather more than 1 mm long; roots, at least usually, not clustered; not feathery; macrospores with 9 floats. (*A. pinnata* R. Br. of Australia is a larger plant, regularly branched, with very feathery roots.)

Tropical Africa to the Philippines and Nippon.

EUFILICINEÆ.

5. OSMUNDACEÆ.

Rhizome mostly erect, stout; fronds pinnate to tripinnatifid, veins free; sporangia on specialized fronds or parts of fronds, or the backs of normal fronds, annulus reduced to a cluster of thick-walled cells, slit extending from this cluster across the apex to the other side of the sporangium; indusia wanting.

A small family related to the *Gleicheniaceae* and *Schizaeaceae*, and probably to the eusporangiate ferns. Three genera: *Leptopteris* (7 species) in Australasia; *Todea* (1 species) from New Zealand to S. Africa; and *Osmunda*.

OSMUNDA Linnaeus.

Sporangia entirely covering very reduced segments which may make up certain pinnæ, or whole fronds, the fertile pinnæ more compound than the sterile; fronds pinnate or bipinnate, pinnæ and pinnules articulate to rachises. Ten species, one in Brazil, beside the following. The three species of the eastern United States all reappear in eastern Asia, but are wanting in the western United States.

Sterile fronds bipinnate (EU-OSMUNDA).
- Pinnules not acute at base.
  - Pinnules oblong or lanceolate, not adnate ..... 1. *O. regalis*
  - Pinnules almost round, mostly adnate ..... 2. *O. mildei*
- Pinnules acute at base ..... 3. *O. lancea*

Sterile fronds deeply bipinnatifid (OSMUNDASTRUM).
- Fertile and sterile fronds distinct ..... 4. *O. cinnamomea*
- Fertile and sterile pinnules on same frond ..... 5. *O. claytoniana*

Sterile pinnæ not deeply pinnatifid (PLENASIUM).
- Pinnæ narrowly linear ..... 6. *O. bromeliifolia*
- Pinnæ lanceolate or linear-lanceolate.
  - Pinnæ with salient teeth ..... 7. *O. banksiifolia*
  - Pinnæ with appressed teeth or entire.
    - Larger pinnæ more than 25 cm long ..... 8. *O. javanica*
    - Larger pinnæ less than 20 cm long ..... 9. *O. vachelii*

1. **Osmunda regalis** L.

Stipes tufted, usually more than 30 cm high; frond, excluding stipe 50 to 120 cm high, 30 cm or more broad, bipinnate, a few apical pinnæ fertile; pinnæ approximately opposite, short-stalked; pinnules subsessile, 3–5 cm long, about 1 cm broad, the sides parallel, obtuse, unequally truncate at the base, finely serrulate, subcoriaceous, glabrous; fertile pinnules reduced, cylindrical, lobed or pinnate.

Var. **japonica** Thunb. (Plate XI.)

Usually smaller than the typical form, sterile and fertile fronds distinct; the sterile pinnules gradually narrowed upward from a broad base.

Cosmopolitan, but unknown in the Philippines, Malaya and Australia: the variety *japonica* is the common form from Japan to India.

2. **Osmunda mildei** C. Chr. (*O. bipinnata Hook.*)

A rather smaller fern than *O. regalis,* upper sterile pinnæ entire, the others with an entire distal segment about 3 cm long and 10 to 14 mm broad with rounded apex, lobed below this, and below the lobes bearing pinnules 10 to 17 mm long, about 9 mm broad, entire, rounded at both ends and adnate to the winged rachis, fertile pinnæ typically at base of frond, but often found elsewhere, or almost the whole frond fertile.

Hongkong and adjacent mainland.

3. **Osmunda lancea** Thunb.

Like *O. regalis* var. *japonica* except for the sterile pinnules, which are 3.5 to 4 cm long, at most 7 mm broad, acute at both ends, serrulate only above the middle, and borne on stalks 1 to 3 mm long.

Japan.

4. **Osmunda cinnamomea** L.

Stipes densely tufted, 30 to 60 cm high, those of the fertile frond the higher and more densely woolly: sterile frond 50 to 100 cm high, about 20 cm wide, abruptly contracted at the top: pinnæ sessile, close, 10 to 13 cm long, about 25 mm broad; acuminate, cut almost to the costa; lobes close, subfalcate, and traversed obliquely by the main vein in (typical) American plants, more remote and straighter in Japanese specimens, oblong, subcoriaceous, glabrescent; fertile frond 20–35 cm high, hardly 3 cm wide, dense, bipinnate, transient.

Eastern Asia south to China; America.

Var. **fokienense** Copel.

Fronds less than 1 m high including stipe, about 10 cm broad, when very young ciliate, especially in the sinuses, otherwise practically glabrous, coriaceous; segments almost straight, oblong, rounded.

Collected by Mr. Dunn in Fokien, No. 3763.

5. **Osmunda claytoniana** L.

Frond less woolly when young; pinnæ obtuse; segments rounded, the vein hardly oblique, texture herbaceous; fertile pinnæ borne midway, with upper and basal parts of frond sterile; otherwise like *O. cinnamomea.*

The Himalayas and western China; eastern United States.

6. **Osmunda bromeliifolia** (Presl) Copel. Philip. Journ. Sci. Bot. 2 (1907) 147.

Stipe 25–40 cm high, slender; frond including stipe usually less than 1 m high; pinnæ borne at an acute angle, the larger ones up to 23 cm long, 7 to 9 mm broad, on stalks more than 1 cm long with acuminate base and long-acuminate apex, sharply serrate except near the base with teeth about 5 mm long and 0.5 to 1 mm deep, glabrous, hard-coriaceous, veinlets mostly simple; fertile pinnæ medial, considerably shorter than the sterile, pinnate and the pinnules lobed.

Luzon, Mindoro.

7. **Osmunda banksiifolia** (Presl) Kuhn.

Caudex sometimes 60 cm high and 15 cm thick, stipe stout; frond including stipe 1.5 to 2 m high; pinnæ about as long as in the preceding species and more than twice as broad, short-stalked, acuminate, acute at base, serrate with prominent teeth as long as in the preceding species

and 2 or 3 times as deep; veinlets mostly forked; otherwise like *O. bromeliifolia.* A form found in Benguet, has teeth 6 mm deep.

Philippines, Moluccas and southern China, Japan; Kamtchatka.

8. **Osmunda javanica** Bl.

Stipe and rachis very stout; frond sometimes 3 m high and 60 cm wide; larger pinnæ 30 cm or more long, 2 to 3 cm broad, on stalks more than 1 cm long, acuminate, cuneate at base, sinuate or entire, coriaceous; veins not pinnate but dichotomous, veinlets parallel, straight; fertile frond irregularly lobed, but rarely to the costa, sporangia massed on the margin.

Malay Islands.

9. **Osmunda vachelii** Hooker.

Stipes 15 to 30 cm high, stouter than in *O. bromeliifolia;* frond 40 to 90 cm high; pinnæ 10 to 15 cm, rarely more, long, not quite one-tenth as broad, on stalks 3 to 5 mm long, acute or acuminate, acute at base, subcoriaceous or coriaceous, entire or shallowly serrate with long, flat teeth; fertile pinnæ reduced, pinnate with round or lobed pinnules. Entire and serrate pinnæ can be found on the same fronds.

China, India.

NOTE.—The proper definition of the species of the § *Plenasium* has always been a puzzle. Various botanists have reduced them to a single one. If this can be done, its name must be *O. bromeliifolia,* but *O. javanica* is very different. I have not much fear of having made two species where I should have recognized but one; but do suspect that what I have called *O. vachelii* will some day be divided.

6. SCHIZAEACEÆ

Sporangia borne singly (not in sori), each derived from a single cell, opening by a lengthwise slit; annulus a complete transverse ring at or just below the apex of the sporangium; fertile teeth or segments of the frond very contracted; stems terrestrial; fronds erect or with scandent rachis. Beside the following two, there are two genera in America and in and near Africa. There are about 120 known species.

Frond scandent ..... 1. *Lygodium*
Frond small, erect ..... 2. *Schizaea*

1. LYGODIUM Swartz.

Rhizome underground; leaves with scandent rachis of indefinite growth, constantly dichotomous, but alternate branches on the right and left almost dwarfed, and bearing a single pair of pinnæ, while except at the base of young leaves the main rachis or preferred branch bears no pinnæ; pinnæ dichotomous or pinnate; sporangia borne on special teeth or spikes, each with only enough lamina to cover the sporangia; in each spike the veinlet is sympodially branched, the alternate branches bearing

each one very oblique sporangium and its indusium. A genus of about 30 species, in the tropics of both hemispheres, and reaching to New Zealand, Japan and New England.

Veins free.
  Pinnae dichotomous or palmate.
    Pinnules cuneate at base ..... 1. *L. circinnatum*
    Pinnules auriculate on the outer side ..... 2. *L. semihastatum*
  Pinnae pinnate.
    Ultimate pinnules articulate to stalks ..... 3. *L. scandens*
    Ultimate pinnules not articulate.
      Fertile fronds not more compound than sterile.
        Dwarf-branch short or obsolete.
          Ultimate pinnules regularly pinnately lobed ..... 4. *L. polystachyum*
          Ultimate pinnules not regularly pinnately lobed ..... 5. *L. flexuosum*
        Dwarf-branch long ..... 6. *L. mearnsii*
      Fertile fronds more compound than sterile ..... 7. *L. japonicum*
Venation reticulate.
  Terminal segments about 6 ..... 8. *L. matthewi*
  Terminal segments usually 2 ..... 9. *L. merrilli*

1. **Lygodium circinnatum** (Burm.) Sw.

Dwarf-branches 0 mm long; pinnæ with stalks 5 cm long, more or less, the sterile ones then dichotomously palmate but simple, or once or twice dichotomous and each division cut almost to the base into 2 or 3 lobes, cuneate at the base and slightly decurrent; lobes lanceolate, acuminate, entire, 10 to 30 (usually about 15) cm long, 1.5 to 3 cm wide, herbaceous or subcoriaceous, young tips hairy; veins free, close; fertile pinnæ usually twice dichotomous and the ultimate division cleft very nearly to the base; lobes linear, lamina sometimes slightly, sometimes very much reduced, venation lax; spikes continuous along the margin, 2–5 mm long, brown. I suspect that *L. basilanicum* Christ is a dwarfed form of this species. Van Alderwerelt reports from Banca a plant seemingly intermediate between *L. circinatum* and *L. trifurcatum* Baker. *L. digitatum* Presl can not be distinguished as a species.

Queensland to northern India, southern China, and the Batanes Islands.

L. trifurcatum Baker, a Melanesian plant reported from Celebes by van Alderwerelt, has the spikes in groups of two or three.

2. **Lygodium semihastatum** (Cav.) Desv.

Like *L. circinnatum* in plan, but usually larger throughout, the final pinnules auricled on one side (sometimes on both sides) at the base, the lobes less acuminate, and the sterile margins almost always finely crenate-serrate. *L. teysmannii* v. A. v. R. is, judging by the description, very like this species; in Philippine *L. semihastatum* the pinnæ are often twice forked.

Luzon to Mindanao and Borneo; Mariannes (?).

3. **Lygodium scandens** (L.) Sw.

Dwarf-branch hairy, about 5 mm long, with a small terminal bud buried in crinite hairlike brown scales; pinnæ usually 10–15 cm long, pinnate; pinnules 3 to 5 on a side, alternate, simple, deltoid-lanceolate, acute or obtuse, minutely crenulate, cordate or truncate at the base and articulate to a very narrowly winged stalk about 5 mm long; terminal pinnule usually palmately lobed; fertile pinnules usually smaller and rounder than the sterile. From both India and New Guinea I have mixtures of sterile pinnæ of this species with fertile ones of *L. flexuosum*.

Africa to Polynesia, north to Formosa and southern China.

4. **Lygodium polystachyum** Wall.

Rachises hairy; dwarf-branch almost obsolete, with a small scaly terminal bud; pinnæ about 20 cm long, pinnate; pinnules short-stalked, 3–5 cm long, deltoid-lanceolate, regularly pinnatifid more than halfway to the costa into oblong, rounded segments, thinly herbaceous, glandular-hairy on the veins; fertile segments contracted, each to one spike.

Birma and the Malay Peninsula.

5. **Lygodium flexuosum** (L.) Sw.

Dwarf-branch 0 to 2 mm long; pinnæ pinnate, 20 cm more or less long, often hairy throughout, rachis usually very narrowly winged; lower pinnules long-stalked, upper ones almost sessile, stalks winged; pinnules entire and narrowly deltoid-lanceolate, or with basal lobes on one side or both (usual form), or pinnate with one pinnule on each side and each of them with a short, broad lobe on the basal side; ultimate pinnules or divisions usually 3 to 7 cm long, sometimes longer, lanceolate, usually acute or acuminate, truncate or cordate at base, the sterile margin finely serrate.

This is the most variable species of *Lygodium*. Hooker and Baker in Synopsis Filicum state that *L. salicifolium* is a "form with small neat long-stalked segments." I can not distinguish the "*L. salicifolium* Pr." collected at Chittagong by Hooker and Thompson from typical *L. flexuosum*.

Queensland to India, southern China, and Luzon.

6. **Lygodium mearnsii** Copel. Philip. Journ. Sci. Bot. 3 (1908) 37.

Dwarf-branch 5 to 9 mm long; sterile pinnæ 15 cm more or less long, often wider than long; pinnules 2 or 3 on a side, the lowest with a stalk 1 cm or more long, pinnate, rachis winged; pinnules [11] usually 1 on a side, lobed on each side at the base, and the lobe on the lower side in its turn lobed on one side, terminal segments lanceolate, mostly obtuse, crenate-serrate into broad, shallow, denticulate teeth, herbaceous, glabrous; succeeding pinnules smaller and more simple; fertile pinnules smaller, broader, and less cut, the spikes broad and flat.

Batanes Islands.

7. **Lygodium japonicum** (Thunb.) Swtz.

Dwarf-branches 2 to 4 mm long; pinnæ up to 25 cm long, and 15 cm broad, usually about two-thirds this size, rachis very narrowly winged; pinnules decreasing upward in size and complexity, the lowest long-stalked, pinnate; pinnules [II] 1 or 2 on a side, the lower stalked, lobed at the base and the lobes often auricled on one side, end segments longest, linear, obtuse, herbaceous, usually somewhat hairy, margin finely toothed; fertile pinnæ sometimes tripinnate, with small and numerous ultimate pinnules of which lateral ones are as broad as long, lamina reduced and sometimes almost wanting; spikes usually 3 or 4 mm long. This also is a very variable species. Specimens with partially fertile pinnæ are sometimes hard to distinguish from *L. flexuosum:* but as a rule the linear sterile segments and strong dimorphism make this species very easily recognized. Korean plants have most finely dissected sterile fronds. Specimens from India and Java have the sterile segments narrow but too short to be linear. The Philippine plants have most ample and least compound fertile pinnæ. A specimen from Negros has spikes reaching a length of 2 cm.

Japan and Korea to India and Australia.

8. **Lygodium matthewi** Copel. Philip. Journ. Sci. Bot. **3** (1908) 36.

The giant of the genus with rachis 5 mm thick, and pinnæ more than 50 cm long; dwarf branch 0 mm long, with very large terminal bud; pinnules 1 or 2 on a side, long-stalked, cordate, dichotomously forked or palmate; terminal pinnules cuneate-cordate, dichotomously palmate with 5 or 6 segments which are 20 to 30 cm long, 3 to 4 cm wide, acuminate, irregularly serrate, herbaceous, venation copiously reticulate, fertile pinnæ unknown.

Luzon, Mount Maquiling, alt. 300 m.

9. **Lygodium merrilli** Copel. Philip. Journ. Sci. Bot. **2** (1907) 146, *Pl. IV.* (Plate XII.)

Rachis 1.5 mm thick, hairy or glabrescent; dwarf-branch 0 mm long; pinnæ up to 35 cm long: pinnules 2 or 3 on a side, the lower long-stalked, forked or rarely dichotomously palmate, decurrent-truncate, terminal pinnule forked or rarely twice forked, segments up to 15 cm long and 17 mm broad, obscurely serrate, membranaceous, glabrous; spikes about 5 mm long and 1.5 mm broad, on the tips of rather prominent teeth, which do not appear in the cut with the original description; venation reticulate.

Mindoro, alt. 300 m.

2. **SCHIZAEA** Smith.

Rhizome under or on the ground; fronds crowded, erect, sterile parts terete, or simple and grass-like, or dichotomous: sterile segments or spike born at the top; sporangia in a row along each side of the unbranched vein, protected by the reflexed margin. A genus of about 25 species,

widely scattered, but chiefly in the tropics; there are a number of species peculiar to New Guinea.

Fertile spikes pinnately arranged.
  Frond terete.
    Spikes 4 to 6 on each side ..... 1. *S. malaccana*
    Spikes 10 to 20 on each side ..... 2. *S. fistulosa*
  Frond flattened ..... 3. *S. dichotoma*
Fertile spikes digitately arranged ..... 4. *S. digitata*

1. **Schizaea malaccana** Baker.

Stipes dense, not distinguishable from the frond, which is 10 to 20 cm long, weak, flexuose, subterete, simply channeled in front, not more than 0.3 mm thick, the sterile and fertile ones similar; fertile segment erect, often bilateral, 6 mm deep, with 3 to 6 slender spreading spikes on each side, the lowest 4 to 5 mm long.

Malaya to Birma; Philippines (?).

2. **Schizaea fistulosa** Labill.

Frond 10–30 cm high, rigid, rush-like; fertile segment suberect, about 20 mm long with 10 to 20 rather erect spikes on each side, the lowest 3 mm long; otherwise like the preceding.

Borneo, *teste* Christ: Madagascar eastward to Chile.

3. **Schizaea dichotoma** (L.) Smith. (Plate XIII, A.)

Rhizome deep-seated; stipes very crowded, not distinct from blade of frond, 10 to 30 cm up to the lowest fork, channeled in front, upper part and branches narrowly winged, branches 1 to 2 mm wide, repeatedly dichotomous; fertile segment terminal, dense, with usually 5 to 8 spreading hairy spikes on each side. A dwarfed form grows on the bases of coconuts.

Madagascar to Polynesia, northward to southern India and Luzon.

4. **Schizaea digitata** (L.) Sw. (Plate XIII, B.)

Stipes densely clustered brownish 2–5 cm high according to depth of rhizome, merging into the green frond which is up to 40 cm high and 4 mm broad, unbranched, coriaceous, the costa very salient beneath; fertile segment apical, so short that the spikes appear whorled; spikes 2.5 to 4 cm long, 1 mm broad, brown.

Malaya to Fiji, the Bonin Islands and the Himalayas: Madagascar (?).

7. GLEICHENIACEÆ.

Terrestrial ferns; last divisions of the axes of the fronds bearing pinnately arranged leaflets or segments; venation free; sori on the backs of ordinary fronds, made of a few sporangia visible to the naked eye, indusia wanting; annulus transverse, not much above the middle; dehiscence by a longitudinal slit. Two genera: *Stromatopteris,* with a single New Caledonian species; and *Gleichenia.*

GLEICHENIA Smith.

Rhizome creeping; frond erect or subscandent, with a terminal bud, and one or few pairs of pinnæ below it, the succeeding few divisions usually dichotomous. Nearly 80 recognized species, chiefly tropical.

Subgenus I. EUGLEICHENIA. Segments very small and round.
- Largest scales hardly 1 mm long, very lacerate ..... 1. *G. circinnata*
- Pubescence including paleæ 1.5 to 2 mm long ..... 2. *G. vulcanica*

Subgenus II. DICRANOPTERIS. Segments larger, oblong to linear.
- Fronds pinnatifid or pinnate above the upmost fork.
  - No special leaflets borne at the forks.
    - Segments crenate ..... 3. *G. amboinensis*
    - Segments serrulate near apex only ..... 4. *G. hirta*
    - Segments entire.
      - Segments distinct and separate ..... 5. *G. hispida*
      - Segments contingent or confluent.
        - Segments coriaceous.
          - Segments not horizontal.
            - Segments obtuse ..... 6. *G. vestita*
            - Segments acute ..... 7. *G. loheri*
          - Segments horizontal ..... 8. *G. laevigata*
        - Segments not coriaceous.
          - Segments descending along several internodes.
            - Segments horizontal ..... 8. *G. laevigata*
            - Segments not horizontal ..... 9. *G. oceanica*
          - Segments on only 1 or 2 internodes ..... 10. *G. hallieri*
  - Each fork bearing a pair of special leaflets.
    - Segments rigidly coriaceous, bullate ..... 11. *G. crassifolia*
    - Segments not rigid, usually plane ..... 12. *G. linearis*
- Fronds bipinnatifid above any fork.
  - Segments not at nearly a right angle ..... 13. *G. laevissima*
  - Segments standing at almost right angles.
    - Segments clothed beneath with dense pubescence ..... 14. *G. bullata*
    - Segments not densely pubescent.
      - Pinnules stalked, lower segments reduced ..... 15. *G. norrisii*
      - Lower segments not reduced ..... 16. *G. japonica*

1. Gleichenia circinnata Swtz.

Rhizome stout, creeping, woody; well-developed fronds more than 50 cm high, once or twice forked at the top with 1 to 3 pairs of pinnæ below the lower fork, the pinnæ once or twice forked, and the lowest sometimes with a pair of lateral pinnæ; axes brown, clothed with minute, rather deciduous, dark brown, deeply lacerate scales; pinnules linear, sometimes 55 mm long, about 1.5 mm wide except at the base, borne on all axes except the main rachis, cut to almost the costa into roundish, strongly bullate, entire coriaceous lobes or segments, the lowest pair of which are usually much enlarged, costa naked above, lacerate-squamulose beneath; sori of 2 to 4 sporangia.

Malacca, Borneo, and Palawan to New Zealand; on mountain tops.

The var. *borneensis* Baker of Mount Kinabalu is described as having more naked axes, longer pinnæ, and more bullate segments.

2. **Gleichenia vulcanica** Bl.

Like the preceding, but more alpine in habit, more densely pubescent, the larger scales 1.5 to 2 mm long, ciliate rather than deeply lacerate, and usually reddish- or greyish-brown. Stunted specimens are not at all forked, bearing the "pinnules" directly on the unbranched main axis of the frond.

Java, Celebes, Philippines.

3. **Gleichenia amboinensis** v.A.v.R. Bull. Dep. Agr. Ind. Neerl. **18** (1908) 3.

Fronds 50 to 100 cm high, dichotomous at the apex, otherwise pinnate; rachis clothed with deciduous, tomentose or furfuraceous pubescence; pinnæ 2 or 3 pairs, erecto-patent, the upper ones dichotomous, the lowest pinnate, dichotomous at the apex; pinnules dichotomous, all their branches foliaceous, deeply pinnatifid; segments linear-oblong, obtuse, crenate, subcoriacous, usually glacous beneath, 1 to 2 cm long, about 2 mm wide, the lowest ones usually reduced and suborbicular; the ultimate branches acuminate, with coarsely toothed apex; costæ with a deciduous pubescence.

Amboyna, Buru.

4. **Gleichenia hirta** Bl. (*G. dolosa* Copel.)

Frond, including stipe, often 1.5 m or more high; stipe very stout, brown-scaly at the base, younger axes bearing a pale scurf and ciliate, lanceolate, brownish scales 1.5 mm long; rachis forked at the top but with a terminal bud of apparently indeterminate growth, and below this usually 2 to 4 pairs of pinnæ, which are 3 or 4 times forked and foliaceous above the second fork from the bottom; ultimate branches up to 25 cm long; segments up to 13 mm long and 2.5 wide, not quite horizontal, just in contact at the base, serrulate at the apex and rather obtuse, herbaceous, glabrous above but not beneath, usually very glaucous beneath; sori of 3 or 4 sporangia. A beautiful plant.

Philippines, Moluccas: Java?

5. **Gleichenia hispida** Mett.

Fronds 50 to 100 cm high, stipe very stout and brittle, younger axes densely ferruginous-felty, and the growing tips buried in felt, the paleæ sparsely long-ciliate; rachis forked at apex, and below this bearing 1 to 3 pairs of pinnæ which are usually 3 times forked and foliaceous throughout; segments not quite horizontal, mostly straight, up to 22 mm long, about 1.5 mm wide, acute, moderately revolute, distinct and separated by their own width, coriaceous, glabrous above; sori mostly of 4 sporangia. *G. koordersi* Christ seems to be a rather depauperate form of this species.

Java, Celebes, Ternate and Luzon, on mountain tops.

6. **Gleichenia vestita** Bl.

Fronds 50 to 100 cm high, the axes clothed with brown scales 3 to 5 mm long, 1 mm wide; rachis light brown, forked at the apex, and below this bearing one or more pairs of pinnæ which are 1 to 3 times forked

and everywhere foliaceous, the final branches up to 25 cm long; segments 10 to 14 mm long, 3 mm wide, confluent, obtuse, falcate or not horizontal, revolute when dried, coriaceous, glabrous unless at the base of the costa beneath, more or less glaucous beneath: sporangia 3 or 4 in a sorus.

Malaya, on high mountains.

7. **Gleichenia loheri** Christ.

Creeping stem and bases of stipes clothed with dark-brown, lanceolate, entire paleæ 5 mm long, stipes about 30 cm high; rachis bearing paired pinnæ, and the lowest of these, in well-developed specimens, also with 1 or 2 pairs below the final fork, the axes everywhere foliaceous or bearing segments only down to the lowest fork, clothed with tawny, lanceolate, subulate, lacerate-ciliate spreading scales; branches finally twice forked at an acute angle, the ultimate branches up to 20 cm long; segments not horizontal, barely confluent, deltoid-lanceolate, acute, 2.5 to 3 mm wide at the base, 12 mm long, revolute in drying, coriaceous, dark-brownish-green above, paler beneath but not glaucous, glabrous except on the costules beneath.

Luzon, Mount Banajao.

8. **Gleichenia laevigata** (Willd) Hook.

Rhizome naked, woody; frond up to 150 cm or more high, stipe and rachis brown, slender, naked, smooth, marked above by two sharp lines, forked at the top, and below this bearing 0 to 5 pairs of pinnæ, in whose axils and at the apex some small, congested, green bracts are sometimes found; pinnæ 2 to 5 times forked, everywhere foliaceous, widely divaricate, ultimate branches up to 20 cm long, axes glabrous or bearing very minute, spreading scales; segments at right angles, connected by a narrow wing, up to 4 cm long, 2 mm wide, straight, entire, obtuse, herbaceous or fairly coriaceous, more or less glaucous beneath, glabrous unless on the costa beneath; sori of 3 or 4 sporangia, sometimes subtended by lacerate squamules.

Malaya, widespread at mean altitudes.

9. **Gleichenia oceanica** Kuhn.

Frond up to 2 m high; pinnæ in small plants a single pair at the top, but in large specimens several pairs lower down, several times dichotomous at an acute angle, ultimate branches 10 cm or more long, deeply pinnatifid, rachises densely clothed with lanceolate, ferruginous, fimbriate scales; segments on all (or all but the lowest) axes of the pinnæ, standing at an acute angle, close, short, 2 mm wide, acute, abruptly reduced toward the apex of the branch, membranaceous, glaucous beneath; sori medial.

I have followed Christ in framing this diagnosis, as the species is known in Malaya only by the Celebes plant determined by him. Kuhn says explicitly that the segments stand at a right angle, and are obtuse, and up to 24 mm long.

Celebes, Polynesia.

10. **Gleichenia hallieri** Christ.

Rachis stout, chestnut, bearing a few brown subulate hairs, subnitent, bearing paired lateral pinnæ below the apex; pinnæ about 3 times forked, the lower "internodes" about 3 cm long, 2 cm wide, acuminate; segments only above the second fork from the apex, and deciduous except on the ultimate branches, crowded but not imbricate, 1 cm long, 2 mm wide, entire, rather obtuse, thin-herbaceous, not glaucous beneath, very slightly hairy; sori fugacious.

Borneo.

11. **Gleichenia crassifolia** (Presl) Copel.

Frond very small or up to 40 cm high and broad, very hard and rigid throughout, glabrous except the youngest part but the base of the stipe rough; axis once forked and the branches pinnatifid into segments, or forked and each branch once or twice forked, or, in the best-developed specimens, forked at the apex and with a pair of twice-forked pinnæ lower down; a simple or pinnatifid foliaceous bract is borne stipule-like at each forking of naked axes; ultimate branches linear-lanceolate, obtuse, entire toward the apex; segments oblong, obtuse, bullate; sori of 4 to 9 sporangia.

Luzon, Mindanao, on the highest mountains.

12. **Gleichenia linearis** (Burm.) Clarke.

Fronds with stipule-like leaflets at the forks, beside these only the ultimate branches foliaceous, the segments linear or linear-oblong. One of the most variable of ferns, as here construed. It is usually glabrous, and glaucous beneath; and subcoriaceous, but varies to herbaceous and to decidedly hard; mature, fertile fronds vary from 40 cm to 6 m in height; they may be once forked, or several times forked or forked at the top with paired lateral leaflets lower down, and these leaflets may also bear paired leaflets below the fork; sporangia up to 14 in each sorus. An exceedingly variable species, construed here as including *G. Warburgii* Christ.

Japan and Korea to New Zealand, and throughout the tropics.

13. **Gleichenia laevissima** Christ. (Plate XIV.)

Stipe stout, up to 60 cm high, 6 mm in diameter, scaly and verrucose at the base, otherwise smooth, forking once, terminal bud of stramineous, scarious scales; branches (pinnæ) ascending, 40 to 60 cm long, bipinnatifid, their axes all naked, stramineous or brown; pinnules alternate, borne at acute angles, short-stalked, up to 17 cm or more long, acuminate; segments linear, borne at acute angles, up to 18 mm long, 1.5 to 2 mm wide, subacute, entire, bullate, glabrous, not glaucous, coriaceous; sori of 3 to 5 sporangia, almost covering the surface.

China, Luzon.

14. **Gleichenia bullata** Moore (*G. arachnoides* Mett.)

Like *G. japonica,* but the segments rigidly coriaceous, bullate, clothed beneath with dense, cobwebby, ferruginous pubescence; and the costæ, at least near the base, bearing lanceolate, apiculate, dark-chestnut scales, 2 mm long, with whitish ciliate margins.

Java, on summits of high mountains.

15. **Gleichenia norrisii** Mett.

Pinnæ a single pair at the top of the stipe, 60–90 cm long; pinnules lanceolate, the lower distinctly stalked, 15–23 cm long, cut to a narrow wing into close, entire, ligulate, obtuse segments, rigidly coriaceous, glabrous on both surfaces, green or glaucous beneath; sori medial, 12 to 20 to a segment.

Malacca.

16. **Gleichenia japonica** Spr. (*G. longissima* Bl. *G. glauca* (Thunb.) Hook., non Swartz).

Stipe stout, in large plants 1 to 2 cm high, usually forked only at the top, but not rarely bearing pairs of pinnae lower down, terminal bud of foliaceous bracts; pinnæ more or less horizontal, 1 to 2 m long, almost bipinnate, rachises winged by narrow ridges, glabrous or more or less beset with tawny, entire or somewhat ciliate scales beneath and on the sides, sometimes white-cobwebby on top; pinnules up to 20 cm or more long, standing mostly at right angles to the rachis, acuminate, sessile or nearly so, linear-lanceolate, cut almost to the chaffy or glabrescent costæ; segments standing at almost a right angle, close, broadly linear, obtuse, entire, herbaceous to coriaceous, dark-green and glabrous above, almost glabrous or with scaly costules beneath, and paler, and usually glaucous.

The typical Japanese plant is of moderate size, the pinnules not quite at right angles to the rachis, comparatively thin in texture, and conspicuously glaucous.

G. gigantea Wall. is a large form, the bases of whose segments form raised lines along the costæ.

G. excelsa J. Sm. is the very large coriaceous form common in the Philippines, the lowest segments often lacerate on the side toward the rachis.

Japan to India and Polynesia and Australia.

8. PARKERIACEÆ.

Rhizome in mud: fronds clustered, usually tripinnatifid, dimorphous; veins reticulate without free included veinlets; sporangia scattered, not in sori, opening by a transverse slit, annulus of very numerous cells or rudimentary. A single genus.

CERATOPTERIS Brongniart.

Characters those of the family. A single species.

Ceratopteris thalictroides (L.) Brongn. (Plate XV.)

Stipes 5 to 30 cm high, fleshy; frond deltoid-ovate; rachises flattened and winged; pinnules few and their segments very few; sterile segments oblong or lanceolate, usually obtuse, entire, fleshy or membranaceous; fertile segments narrowly linear, acute, often deficient in chlorophyll, the margin folded over the sporangia. This fern is common in wet meadows and along ditches. The fronds normally stand above the water, but the sterile are not rarely immersed.

Pantropic, and north to Japan.

9. MATONIACEÆ.

Rhizome creeping hairy; fronds dichotomous but with unequal development of the branches; sori dorsal, of few (up to 14) sporangia borne on or at the base of a raised receptacle, which also bears the umbrella-shaped peltate indusium; sporangia opening almost transversely; annulus only oblique enough to be complete. Two genera and only three known species. Perhaps the remnant of a primitive group ancestral to *Polypodiaceae* and *Cyatheaceae*.

Frond erect, pedate or fan-shaped ..... 1. *Matonia*
Frond pendent, sympodial, elongate ..... 2. *Phanerosorus*

1. MATONIA R. Brown.

Fronds erect stout, rachis forked at the apex, each branch giving off pinnatifid pinnae on the upper (inner) side; veins free except that the sori are borne where a number of veinlets converge; indusium curved back under the sporangia almost to the receptacle.

Segments oblique, acute ..... 1. *M. pectinata*
Segments at a right angle, obtuse ..... 2. *M. Foxworthyi*

1. **Matonia pectinata** R. Br.

Stipe rigid, about 2 m high when well developed; longer pinnæ 20 (to 60?) cm long, linear, hard-coriaceous, brownish above, more or less glaucous beneath, glabrous; segments borne at an acute angle, falcate, narrowed from the base, acute; sori borne at the bases of the segments; sporangia about 7.

Malacca, Mount Ophir; Amboyna?

2. **Matonia foxworthyi** Copel. Philip. Journ. Sci. Bot. 3 (1908) 343. (Plate XVI.)

Like the preceding species, but the segments horizontal, straight, obtuse, truncate, or retuse, linear, up to 35 mm long, often bearing more than one sorus on a side.

Borneo, Sarawak, Mount Poë, alt. 1,700 m.

2. PHANEROSORUS Copeland.

Fronds pendent with slender stipe and rachis, sympodially branched as in *Lygodium,* each dwarf branch bearing a pair of one to three times dichotomous pinnæ; veins free or forming costal areolæ; sori usually just outside these areolæ; indusium but slightly curved under the sporangia; sporangia 10 to 14. Only one species known.

Phanerosorus sarmentosus (Baker) Copel. Philip. Journ. Sci. Bot. **3** (1908) 344. (Plate XVII.)

Fronds up to 1 m. long; ultimate divisions up to 14 cm long, 3 to 4 mm wide, more or less sinuate, obtuse, coriaceous, ash-green; sori sometimes copious, 2 mm in diameter.

Borneo, Sarawak, around limestone caves at Niah and Bidi.

10. CYATHEACEÆ.

Caudex erect and almost always arborescent; fronds usually twice or more pinnate; sori dorsal or marginal, globose, with more or less prominent receptacle; sporangia opening by a transverse slit, the annulus (except exceptionally in *Balantium*) oblique enough to be a complete ring. A family including one or two small genera besides those in this region. Through *Balantium,* at least a part of the genera included here are closely related to the *Polypodiaceae.*

Sori dorsal ..... 1. *Cyathea*
Sori marginal.
  Fertile tooth slightly modified.
    Ultimate divisions oblique..... 2. *Balantium*
    Ultimate divisions not oblique..... 3. *Dicksonia*
  Fertile tooth greatly modified..... 4. *Cibotium*

1. CYATHEA Smith.

Tree ferns (with rare exceptions), often very large; sori on the backs or in the forks of the fertile veinlets. These ferns are usually separated artificially into three genera. *Cyathea, Hemitelia* or *Amphicosmia,* and *Alsophila.* As construed here, *Cyathea* includes about 400 species, chiefly tropical.

1. Frond simple ..... 1. *C. sinuata*
1. Pinnæ not lobed, not cordate..... 2. *C. moluccana*
1. Pinnæ lobed or almost entire, cordate..... 3. *C. hookeri*
1. Pinnules not lobed.
  2. Pinnules less than 2 cm long..... 4. *C. dulitensis*
  2. Pinnules more than 3 cm long.
    3. Rachises glabrous ..... 5. *C. alternans*
    3. Rachises finely hairy above.
      4. Sori not costular..... 6. *C. podophylla*
      4. Sori costular, crowded..... 7. *C. rheosora*

1. Pinnules at least lobed, dimorphous.
   2. Veinlets simple ..... 8. *C. dimorpha*
   2. Veinlets forked.
      3. Fertile pinnules [11] deeply crenate..... 9. *C. fructuosa*
      3. Fertile pinnules [11] not deeply crenate..... 10. *C. mindanaensis*
1. Pinnules at least lobed, not dimorphous, lobes not twice as long as broad.
   2. Indusium evident and persistent.
      3. Rachises clothed with copious hairy chaff..... 11. *C. philippinensis*
      3. Rachises glabrous or bearing minute scales.
         4. Rachis unarmed ..... 12. *C. polypoda*
         4. Rachis bearing spines or prickles.
            5. Squamulae lacerate ..... 13. *C. integra*
            5. Squamulae bullate, not evidently lacerate..... 14. *C. suluensis*
   2. Indusium inconspicuous or wanting.
      3. Axes black or purple.
         4. Sori medial.
            5. Rachis of pinna glabrous..... 15. *C. formosana*
            5. Rachis of pinna pubescent above..... 16. *C. glabra* (*A. dubia*)
         4. Sori costular.
            5. Pinnules pinnate ..... 17. *C. atropurpurea*
            5. Pinnules only lobed.
               6. Frond thin or subcoriaceous, green.
                  7. Sori costular ..... 18. *C. ramispina*
                  7. Sori medial ..... 19. *C. ridleyi*
               6. Frond hard-coriaceous, brown when dry..... 20. *C. recommutata*
      3. Axes brown or stramineous.
         4. Segments separated by a rounded sinus.
            5. Wing narrow, veinlets simple..... 21. *C. sangirensis*
            5. Wing broad, veinlets mostly forked..... 22. *C. obscura*
         4. Segments crowded or close together.
            5. Frond hardly 50 cm long..... 23. *C. hancockii*
            5. Frond 1 m or more in length.
               6. Sori medial, 1 mm in diameter.
                  7. Lamina glabrous ..... 24. *C. squamulata*
                  7. Lamina bearing white hairs beneath..... 25. *C. margarethae*
               6. Sori costular, 0.25 mm in diameter..... 26. *C. boninsimensis*
1. Pinnules at least lobed, not dimorphous, lobes narrow.
   2. Rachis black or purplish-black.
      3. Indusium wanting, axes shining.
         4. Pinnules cut three-fourths to costa..... 27. *C. henryi*
         4. Pinnules cut to costa..... 28. *C. melanorachis*
         4. Pinnules [11] stalked ..... 29. *C. truncata*
      3. Indusium evident, frond tripinnatifid..... 30. *C. aneitensis*
      3. Indusium evident, frond tripinnate, axes dull.
         4. Rachis unarmed..... 46. *C. schizochlamys*
         4. Rachis muricate.
            5. Pinnules [11] 6 mm long, sori medial..... 31. *C. arachnoidea*
            5. Pinnules [11] 12 mm long, sori costular..... 32. *C. tripinnata*
   2. Rachis not nearly black.
      3. Rachis of frond or pinna bearing pubescence of two or more kinds mixed.
         4. Rachis nodulose, pustulose or verrucose.
            5. Pubescence all white or grey.

6. Indusium wanting.
7. Long hairs on secondary rachis copious..... 33. *C. tomentosa*
7. Long hairs on secondary rachis very sparse.
8. Long paleæ without dark marginal setæ..... 34. *C. lepifera*
8. Long paleæ bearing dark marginal setæ..... 35. *C. crinita*
6. Indusium evident..... 36. *C. strigosa*
5. Pubescence partly or wholly reddish.
6. Larger scales sparse.
7. Indusium symmetrical.
8. Prominent "aerophores" on rachis at bases of pinnæ. 37. *C. zollingeriana*
8. Without prominent aerophores..... 38. *C. rufo-pannosa*
7. Indusium false or one-sided.
8. Pinnules II entire ..... 39. *C. heterochlamydea*
8. Pinnules II crenate or lobed..... 40. *C. mitrata*
6. Larger scales copious.
7. Indusium evident..... 41. *C. loheri*
7. Indusium wanting or inconspicuous..... 42. *C. fuliginosa*
3. Rachis unarmed or merely bristly.
4. Indusium present.
5. Pubescence of two kinds of scales..... 43. *C. inquinans*
5. Pubescence of hairs and scales.
6. Segments crenate into bullate lobes..... 44. *C. oinops*
6. Segments entire or crenulate at apex.
7. Frond tripinnatifid..... 45. *C. javanica*
7. Frond tripinnate.
8. Rachis densely pubescent, scales large..... 46. *C. schizochlamys*
8. Rachis sparsely pubescent, scales small..... 47. *C. sumatrana*
4. Indusium rudimentary, rachis above hirsute, without paleæ. 48. *C. raciborskii*
4. Indusium wanting, paleæ on rachis above..... 49. *C. lurida*
2. Rachises of frond or pinnæ pubescent, but not with two kinds of pubescence mixed.
3. Pinnæ 8–15 cm long.
4. Indusium none, sori medial.
5. Frond about 1 m long..... 50. *C. batjanensis*
5. Frond about 45 cm long..... 23. *C. hancockii*
4. Indusium persistent, sori costular..... 51. *C. havilandii*
3. Pinnæ much longer.
4. Costæ scaly beneath or glabrous.
5. Segments glandular-ciliate ..... 52. *C. subglandulosa*
5. Segments not glandular-ciliate.
6. Pinnules nowhere cut to the costa.
7. Sori costular.
8. Indusium breaking irregularly.
9. Sides of segments crenate..... 53. *C. crenulata*
9. Segments serrulate throughout.
10. Pinnæ and pinnules sessile..... 54. *C. foxworthyi*
10. Pinnæ and pinnules stalked..... 63. *C. ferruginea*
9. Segments nearly or quite entire.
10. Scales on costæ dark.
11. Long hairs beneath costæ none..... 55. *C. lanaensis*

11. Sparse long hairs on costæ beneath..... 56. *C. korthalsii*
10. Scales on costæ light..... 57. *C. hymenodes*
8. Indusium opening to form a cup with entire rim. 58. *C. orientalis*
8. Indusium forming a low cup from the start..... 59. *C. walkerae*
8. Indusium wanting.
9. Rachis unarmed..... 60. *C. modesta*
9. Rachis asperulous.
10. Lamina glabrous..... 61. *C. melanopus*
10. Lamina ciliate beneath..... 62. *C. wallacei*
7. Sori medial.
8. Segments not coarsely toothed..... 63. *C. ferruginea*
8. Segments coarsely toothed..... 64. *C. assimilis*
6. Lowest segments free but adnate.
7. Paleæ on costæ fairly copious.
8. Costal paleæ pale, bullate..... 65. *C. negrosiana*
8. Costal paleæ fulvous or rufous.
9. Pinnules 5–7 cm long..... 66. *C. christii*
9. Pinnules 8–12 cm long..... 67. *C. alderwereltii*
7. Paleæ on costæ very sparse or none.
8. Indusium a low cup..... 59. *C. walkerae*
8. Indusium evident and at first complete.
9. Segments crowded..... 68. *C. callosa*
9. Segments not at all crowded..... 69. *C. halconensis*
6. Lowest segments free and contracted at base.
7. Lamina lacerate-scaly beneath..... 70. *C. celebica*
7. Lamina minutely paleaceous or glabrescent; indusium evanescent. 71. *C. teysammnii*
7. Lamina glabrous; indusium persistent..... 40. *C. mitrata*
7. Lamina glabrous or sparsely hairy; indusium wanting or inconspicuous.
8. Lowest pinnules deflexed..... 72. *C. pustulosa*
8. Pinnæ short-stalked, pinnules not deflexed.
9. Costa without setiferous scales.
10. Secondary rachises visibly spiny.
11. Base of stipe without whitish paleæ.
12. Costæ scaly beneath..... 73. *C. latebrosa*
12. Costæ glabrous beneath..... 74. *C. curranii*
11. Base of stipe with broad white and narrow brown paleæ. 75. *C. calocoma*
10. Secondary rachises not visibly rough..... 76. *C. caudata*
9. Costa with setiferous as well as bullate scales.... 77. *C. elmeri*
4. Costa hairy beneath.
5. Indusium persistent and glandular..... 78. *C. adenochlamys*
5. Indusium thin, not glandular.
6. Pinnules cut to the costa..... 79. *C. leucotricha*
6. Pinnules cut to a narrow wing..... 80. *C. burbidgei*
5. Indusium evanescent or none.
7. Secondary rachises very scaly..... 81. *C. albosetacea*
7. Secondary rachises not very scaly.
8. Lamina glabrous, sori costular..... 82. *C. chinensis*
8. Lamina hairy, sori medial..... 83. *C. trichodesma*

2. Rachis glabrous beneath.
3. Costæ strigose beneath.
4. Segments 2 to 3 mm apart..... 84. *C. cyclodonta*
4. Segments close..... 85. *C. andersoni*
3. Costæ very scaly beneath..... 86. *C. kingii*
3. Costæ glabrous beneath or slightly scaly.
4. Indusium at first evident and complete.
5. Costæ subscaly beneath, sori costular.
6. Segments entire, lamina somewhat glaucous beneath.
87. *C. brunoniana*
6. Segments serrate.
7. Rachis spiny.
8. Indusium promptly evanescent..... 88. *C. decipiens*
8. Indusium more persistent..... 89. *C. spinulosa*
7. Rachises not spiny..... 90. *C. mearnsii*
5. Costæ glabrous beneath, sori medial.
6. Dried fronds dark-green above.
7. Pinnules pinnate..... 91. *C. saccata*
7. Pinnules pinnatifid..... 92. *C. runensis*
6. Dried fronds whitish above..... 93. *C. leucophaes*
4. Indusium a ring around base of sorus..... 94. *C. junghuhniana*
4. Indusium wanting.
5. Costæ glabrous above..... 95. *C. mertensiana*
5. Costæ more or less hairy above.
6. Rachises unarmed..... 96. *C. ornata*
6. Rachises pustulose or spiny.
7. Pinnules not more than 9 cm long.
8. Dried frond brown above..... 97. *C. clementis*
8. Dried frond dark-green above.
9. Costæ glabrous beneath..... 98. *C. fauriei*
9. Costæ sparsely scaly beneath..... 99. *C. confucii*
7. Pinnules 10 cm or more long.
8. Paleæ at base of stipe white..... 100. *C. contaminans*
8. Paleæ at base of stipe brown..... 101. *C. fenicis*

1. **Cyathea sinuata** Hook. & Grev.

Caudex 1 m high; fronds undivided, 60 to 90 cm long, 3 to 6 cm broad, sinuate, short-stipitate.

Ceylon, known in a single forest.

2. **Cyathea moluccana** R. Br. (*C. Brunonis* Wall., Hook.).

Trunk short; stipe 30 to 60 cm or more long; fronds 60 cm long, or sometimes much larger; pinnæ entire or nearly so, 15 to 35 cm long, caudate-acuminate, oblique at base and short-stalked.

Malay Peninsula and Archipelago, at low altitudes; unknown in the Philippines.

3. **Cyathea hookeri** Thwaites.

Small but arborescent, trunk 3 to 4 cm thick; stipe short, black, muricate at base and subpaleaceous; frond 60 to 90 cm long, 10 to 13 cm broad, pinnate; pinnæ with broad base auricled on both sides, nar-

rowly lanceolate, acuminate, subsessile, coarsely dentate-pinnatifid, more or less entire toward the apex; veinlets pinnate; sori dorsal on the veins or in the lower axils; indusium breaking into irregular lobes.

Ceylon, with *C. sinuata.*

4. **Cyathea dulitensis** Baker.

Trunk short, 30 cm high; stipe 45 cm long, brown, clothed at the base with large linear-subulate, membranaceous, brown scales, naked upward; frond 30 cm long, 12 to 15 cm broad, thick-coriaceous, green and glabrous on both sides, bipinnate; pinnæ 24 mm wide, lowest reduced and deflexed, the lower ones stalked; pinnules 4 mm wide; linear-oblong, subentire, margin deflexed, the lowest free but adnate; veinlets forked, immersed; sori medial, indusia campanulate, glabrous, persistent, breaking irregularly.

Borneo (Sarawak, Mount Dulit, alt. 1,200 m.)

5. **Cyathea alternans** (Wall.) Presl.

Trunk 3 to 4 m high; frond bipinnate at base; pinnæ up to 45 cm long, 15 cm broad, sometimes much smaller, stalked; pinnules entire or serrate, acuminate; rachis smooth and glabrous, tawny-brown; veinlets once or twice forked; sori more or less biseriate; indusium thin and fragile.

Penang, Borneo.

6. **Cyathea podophylla** (Hooker) Copel. (*Alsophila podophylla* Hooker in Journ. Bot. **9** (1857) 334).

Frond typically simply pinnate, but sometimes bipinnate with almost entire lobes, or even tripinnate; rachises hairy above, dark purplish; sori minute, globose, in one to several rows parallel to the costa, those nearest the costa medial on their veinlets, but those nearest the apex almost costular; indusium none.

This is a variable fern, and not always distinct from *C. glabra.*

Hongkong, Chusan, (?) Liu Kiu.

Alsophila dubia Beddome in Journ. Bot. 26 (1888) 1, is intermediate between *C. glabra* and *C. podophylla,* but said to be nearer the latter. It is described as follows: Rachises purple-brown, slightly furfuraceous above, glabrous beneath; frond subcoriaceo-membranaceous; pinnæ 40 to 50 cm long, pinnate, apex pinnatifid; pinnules 10 cm long, 15 mm broad, on petioles 2 to 3 mm long, very acuminate, more or less truncate at base, pinnatifid only about one-sixth of the way to the costa, lobes rather truncate; costæ scaly beneath or at length glabrous, furfuraceous above; veinlets simple; sori large, usually on the lowest 1 or 2 veinlets, sometimes on 3 or 4 veinlets, then costular and not forming an inverted V as in *C. glabra.*

Perak, alt. 1,200 m, Borneo, Java.

7. **Cyathea rheosora** (Baker) Copel. (*Alsophila rheosora* Baker in Journ. Bot. 28 (1890) 262).

Trunk 1 m high; frond ample, deltoid, bipinnate, moderately firm in texture, green and glabrous on both surfaces; rachises brown, without scales or prickles; pinnæ oblong-lanceolate 45 to 60 by 17 to 20 cm; pinnules lanceolate, deeply crenate, 15 to 18 mm broad, truncate at base, the lower distinctly stalked; main veins 3 mm apart; veinlets 4 or 5 on a side, simple; sori costular, crowded, exindusiate. Related to *C. glabra* and *C. podophylla.*

Tonkin.

8. **Cyathea dimorpha** (Christ) Copel. (*Alsophila dimorpha* Christ in Ann. Jard. Bot. Buiten. II 4 (1904) 41).

Trunk 4 m high; Stipe and rachis chestnut, unarmed but rough, clothed with obscure furfuraceous scales; pinnæ dimorphous, the fertile occupying the middle of the frond; sterile pinnules shallowly lobed with crenulate lobes, fertile pinnules deeply pinnatifid; veinlets simple, about 3 on a side; sori large, exindusiate.

Celebes.

9. **Cyathea fructuosa** Copel. in Elmer's Leaflets, 2 (1908) 419.

Trunk 3 to 5 m high, 10 cm thick; frond almost sessile, 2 m long, 60 to 90 cm broad, tripinnate; rachis setose-paleaceous above, furfuraceous beneath, rough, rachises of pinnæ clothed beneath with minute furfuraceous squamules and large rufo-stramineous scales 5 mm long; costæ clothed beneath with smaller paleæ of the same color; secondary pinnules distinct and separate, 12 mm long, 2 to 2.5 mm broad, dimorphous, the sterile entire or nearly so, the fertile deeply crenate; sori round, crowded; indusium rust-color.

Negros Island, on Horn of Negros Mountain.

10. **Cyathea mindanaensis** (Christ) Copel. (*Alsophila mindanaensis* Christ in Monsunia 1 (1900) 90).

Frond hard-coriaceous; pinnæ 40 cm long, ovate, dimorphous; sterile parts apparently tripinnatifid, the fertile tripinnate; rachis clothed with long, wooly, rufous fibrils, not spiny; veinlets forked; sori minute, costular, exindusiate.

Mindanao, district of Davao.

11. **Cyathea philippinensis** Baker.

Trunk short, slender; frond 1 m long, 30 cm broad; stipe short, very scaly; rachises all densely paleaceous with gray and brown scales, unarmed; larger medial pinnae bipinnate at the base; pinnules sessile, acute, costae sparsely hairy above, scaly beneath; segments 4 mm long, 3 mm broad, entire or crenulate, obtuse, lamina glabrous, coriaceous;

veinlets about 3 on a side, simple or forked; sori medial, indusium persistent in large fragments.

Described from a Philippine plant in cultivation at Kew, and since collected on Mount Banajao, Luzon.

12. **Cyathea polypoda** Baker.

Frond ample, green on both sides, glabrous except for copious whitish, convex, ovate scales, especially on the veinlets beneath; rachis glabrous, unarmed; pinnæ oblong or lanceolate, 45 cm long, 10 to 12 cm wide; pinnules lanceolate, mostly petiolate, lowest 6 cm long, 12 mm broad, cut almost to the costa; segments oblong, obtuse, entire, 3 to 4 mm broad; veinlets 7 or 8 on a side, forked; sori medial, indusium cup-shaped, small, glabrous. Near *C. integra.*

Borneo (Mount Kinabalu, alt. 2,100 m).

13. **Cyathea integra** J. Sm.

Trunk 2.5 to 7 m high; fronds 2 m long; rachises brown, beset with sharp spines and sparsely scurfy with minute scales, a few of which are also on the under side of the costae and costules, costa hairy above; pinnæ 45 cm long, the lower ones somewhat reduced; pinnules 13 cm long or less, 24 mm wide, the lower ones reduced, stalked, cut two-third of the way to the costa into broad, subfalcate, subacute or obtuse, usually entire, thinly coriaceous segments; sori medial, indusium brown, very persistent.

Luzon to Mindanao, Amboyna.

14. **Cyathea suluensis** Baker.

Like *C. integra,* but the rachises less spiny and more scaly, the scales larger and more entire, and more or less bullate, and the frond greener.

Jolo and Mindanao, alt. about 600 m.

15. **Cyathea formosana** (Baker) Copel. (*Alsophila formosana* Baker in Ann. Bot. 5 (1891) 190).

"Frond ample, tripinnatifid, moderately firm, glabrous, green on both surfaces, rachis of pinnae naked, castaneous. Pinnæ oblong-lanceolate, 30 to 45 cm long, 12 to 15 cm broad. Pinnules sessile, lanceolate, nearly 24 mm broad, cut down to a broad wing into oblong lobes 4 mm broad: Veins 6- to 8-jugate. Sori medial." A very variable plant, which is probably not distinct from *C. glabra.*

Formosa.

16. **Cyathea glabra** (Blume) Copel. (*Gymnosphaera glabra* Blume, Enumeratio (1828) 242).

Trunk 1 to 2 m high, slender; stipe rough, scaly at the base, upward, like the rachises, glabrescent, shining, dark purple; pinnæ usually 45 to 60 cm long, stalked; pinnules 5 to 9 cm long, 8 to 15 mm broad, mostly stalked and truncate at the base, acuminate, cut one-fourth to one-half of the way to the rachis, rarely deeper, the lobes triangular, rounded or

ovate, serrate; veinlets simple; sori medial or above the middle of the lowest veinlets, but the upper ones close to the costa, indusium wanting. Nearly related to this species are *C. formosana, A. dubia, C. atropurpurea, C. ramispina, C. podophylla, C. recommutada,* and *C. Hancockii.* The Celebes plant is larger than that found elsewhere in Malaya, but even it is smaller than most tree ferns; a confusion of species is probably responsible for the report of trunks 18 m high in India.

Malaya, India, China, Formosa.

17. **Cyathea atropurpurea** Copel. in Philip. Journ. Sci. Bot. **3** (1908) 354. (Plate XVIII.)

Trunk 2 m high, 4 cm in diameter; frond 150 cm long, 60 cm wide; stipe and rachis purple, unarmed, the base of the stipe clothed with long, rigid, appressed paleæ with pale margins, and bearing some very reduced pinnæ almost without lamina, but not spine-like; rachises bearing purple hairs above and very sparse squamulæ beneath; pinnules 7 cm long, caudate, at the base cut to the rachis and the secondary pinnules contracted at the base, margins serrate, costæ hairy above, beneath bearing bullate scales, as do also the costules, lamina smooth, purplish-green; veinlets simple, about 5 on a side; sori costular, indusium wanting.

Mount Halcon, Mindoro, alt. 750 to 1,050 m, common on ridges.

18. **Cyathea ramispina** (Hooker) Copel. (*Alsophila ramispina* Hooker, Syn. Fil. (1866) 42).

Frond dark-green above, paler beneath; stipe subasperous, ebeneous, as are also the rachises and costæ, scaly at base and bearing 3 to 5 branched, black spines 4 cm long; pinnules 6 cm long, 12 mm wide, cut two-thirds to the costa, costa beneath bearing minute, brown, bullate scales; lobes oval-oblong, obtuse, serrate toward the apex; veinlets mostly simple; sori small, costular, exindusiate.

Borneo (Sarawak, alt. 900 m).

19. **Cyathea ridleyi** (Baker) Copel. (*Alsophila ridleyi* Baker in Ann. Bot. **8** (1894) 122).

Fronds ample, deltoid, tripinnatifid, somewhat rigid, green and glabrous on both sides; rachis naked, dark-chestnut, unarmed; pinnæ 30 cm long, oblong-lanceolate; pinnules 3 to 5 cm long, 8 to 12 mm wide, sessile, linear, subobtuse, base truncate, the lower ones cut halfway to the costa; segments oblong, entire; veinlets 4 to 6 on a side, evident, curved, simple or the lowest forked; sori medial, exindusiate. Related to *C. recommutata* and *C. squamulata.*

Singapore.

20. **Cyathea recommutata** Copel. nomen novum (*Alsophila commutata* Mett. 1863, not *C. commutata* Spr.).

Frond hard-coriaceous, brown when dry; stipe scaly, rough at base, and, like the rachises, dark-purple, subulate-squamulose; pinnæ stalked, 40 cm long; pinnules about 8 cm long, broadest above the middle, stipi-

tate, pinnatifid less than halfway to the costa, serrate, the fertile, at least sometimes, reduced; veinlets about 5 on a side, simple; sori costular, exindusiate.

Malacca; Batjan (fide Christ in Monsunia 90).

21. **Cyathea sangirensis** (Christ) Copel. (*Alsophila sangirensis* Christ in Monsunia 1 (1900) 90).

Frond 70 cm long, broadly ovate-deltoid; stipe stramineous, unarmed, but like the rachis rough with black pustules and hair-like scales; pinnæ 10 to 15 on a side, ovate, their rachises strigose-pilose; pinnules 4 cm long, 1 cm wide, cut to a narrow wing; lobes ovate, obtuse, crenulate, separated by rounded sinuses; veinlets simple; sori 4 on each side, crowded, exindusiate.

Sanguir.

22. **Cyathea obscura** (Scort.) Copel. (*Alsophila obscura* Scort.; Bedd. in Journ. Bot. **25** (1887) 321, *pl. 278, f. 2*).

Caudex 2 m high; stipes 30–60 cm long, densely clothed toward the base with long lanceolate, sharply serrate scales; fronds 120 to 150 cm long, 60 cm broad, bipinnate; rachis scaly above, naked beneath; pinnæ, middle ones 30 to 45 cm long, 8 to 15 cm broad, smaller toward ends of frond, their rachises hairy above, naked beneath; pinnules 4 to 7 cm long, 12 mm broad, truncate at base, apex obtuse, subcoriaceous, glabrous except for hairs on costa and bullate scales on costules beneath, cut halfway to the costa into broad, obtuse segments; veinlets 4 or 5 on a side, simple or more often forked; sori medial on the lower veinlets, mixed with hyaline, moniliform hairs.

Perak.

23. **Cyathea hancockii** Copel. (*Alsophila denticulata* Baker in Journ. Bot. **23** (1885) 102, not *Cyathea*, Goldm.).

Trunk short; stipe 30 cm long, brown, the base clothed with light-brown lanceolate paleæ 1 cm long, the rachis brown, sparsely scaly, glabrescent; frond 45 cm long, moderately green on both surfaces, hairy on the ribs above, the lamina glabrous, but the costules beneath bearing minute, ovate, bullate scales, tripinnatifid but fertile in bipinnate and bipinnatifid forms as well; lower pinnæ largest, lanceolate-deltoid, 10 to 15 cm long, 3 to 5 cm broad, stalked; lower pinnules distinct, sessile, lanceolate, pinnatifid; segments oblong, 2 to 2.5 mm broad, inciso-crenate; veinlets simple or forked; sori medial, superficial, brown, receptacle low, indusium none. Named for its first collector.

Formosa, south China.

24. **Cyathea squamulata** (Blume) Copel. (*Gymnosphaera squamulata* Blume Enumeratio 243).

Trunk 2 m high, 8 cm thick; stipe 30 cm long, unarmed or slightly muricate, bearing broad paleæ 2.5 cm long, bright-brown with darker margins; rachises hirsute above, hairy or slightly scaly beneath; frond

1 to 2 m long, half as wide, narrowed below, herbaceous; pinnæ short-stalked, the middle ones up to 17 cm broad; pinnules short-stalked, close or imbricate, 13 to 16 mm wide, acuminate, cut to a broad wing, costa scaly at base with fuscous, lanceolate ciliate, deciduous scales; segments 4 mm broad, obtuse or truncate, subfalcate, entire or crenulate, costules beneath bearing a few minute lacerate squamules; veinlets 6 or 7 on a side, forked or simple; sori medial, exindusiate.

Malaya (at least, in Java).

25. **Cyathea margarethae** (Schröter) Copel. (*Alsophila margarethae* Schr. ex Christ in Ann. Jard. Bot. Buit. II **5** (1905) 136).

Frond ample, bipinnate; pinnæ 40 cm long, 15 cm wide; pinnules 7 cm long, lanceolate, cut two-thirds to the costa; segments almost imbricate, 4 mm long, 3 mm wide, truncate, entire, the under surface and margin bearing long white hairs and a few minute scales, herbaceous; rachis tawny-brown, unarmed, bearing short chestnut hairs, and pale subulate paleæ 1 cm long; veinlets 5 to 8 on a side, the upper ones forked; sori medial, brown, hardly 1 mm in diameter, mixed with hairs, exindusiate. Conspicuous among Malayan species for its hairyness.

Borneo.

26. **Cyathea boninsimensis** (Christ) Copel. (*Alsophila boninsimensis* Christ in Monsunia **1** (1900) 90; *Hemitelia*, Diels).

Stipe fulvo-stramineous, glabrous, asperulous; rachis minutely rough, glabrous; pinnæ 1 m long, 10 cm wide; pinnules 5 cm long, 15 mm wide, lanceolate, acuminate, cut so as to have exactly the appearance of *Dryopteris filix-mas parallelogramma,* costæ pubescent above; veinlets 7 or 8 on a side, all forked, conspicuous; sori minute, 0.25 mm wide, costular, surrounded by scales but without evident indusium.

Bonin Islands.

27. **Cyathea henryi** (Baker) Copel. (*Alsophila henryi* Baker in Kew Bull. (1898) 229).

Trunk 2 to 6 m high; frond ample, tripinnatifid, fairly firm, green on both sides but paler beneath, glabrous; rachis purplish, scurfy with minute, irregular, stellate scales, unarmed; pinnæ 60 to 75 cm long, 22 to 25 cm broad, their rachises chestnut, shining, hairy above; larger pinnules 13 cm long, 26 mm broad, cut to a broad wing; segments 10 mm long, 4 mm broad, obtuse, subfalcate, serrulate toward the apex with rounded teeth, sinuses narrow; veinlets about 9 on a side, some forked, but the fertile ones simple; sori nearer the margin than to the costule, marked by slight depressions on the upper surface, indusium none.

Yunnan, alt. 1,200 m.

28. **Cyathea melanorachis** Copel. (*Alsophila melanorachis* Copel. in Philip. Journ. Sci. Bot. **2** (1907) 146).

Trunk 2 to 3 m high, 5 cm thick, its apex and the bases of the stipes clothed with rigid, chestnut scales 1 cm long, with pale margins; stipe

60 cm long, like the rachises, black, somewhat rough, and sparsely clothed with tawny, crinite scales; frond 150 cm long, tripinnate; pinnæ about 12 on a side, the longest ones 50 cm long, 13 cm broad, short-stalked; distinct pinnules about 30 on a side, not quite sessile, 7 cm long, 1 cm broad, acuminate, the lower part cut to the costa, costa velvety above, beneath densely covered with scales of two kinds; secondary pinnules narrowly obovate, obtuse, adnate, crenate-serrate, thinly coriaceous, glabrous except for ciliate, bullate scales on the costule beneath, almost black above, the nether surface dark-olive; lower veinlets usually forked, but the fertile ones simple; sori costular, covering the surface of the somewhat contracted fertile pinnules, exindusiate.

Mindoro (Mount Halcon), in mossy woods, alt. 1,800 m.

29. **Cyathea truncata** (Brack.) Copel. (*Alsophila truncata* Brack. in Wilkes U. S. Expl. Exp. **16** (1854) 289).

Rachises dark-purple, shining, sharply muricate, deciduously furfuraceous-tomentose, as are also the costae, and the costules beneath; pinnæ 25 to 40 cm long, 10 to 12 cm broad, acuminate; pinnules 5 to 7 cm long, 6 to 12 mm broad, sessile, pinnate except at the apex; secondary pinnules very small, the lower ones stalked, linear-oblong, acute, the margin recurved, sinuate-lobate; veinlets forked near the base; sori costular, small, dark-orange, exindusiate.

Celebes to Samoa; Japan (?).

30. **Cyathea aneitensis** Hooker.

Rachises unarmed, ebeneous, purple-black, smooth; pinnae 30 to 45 cm long, 10 to 12 cm broad, sessile or nearly so, shortly acuminate; pinnules cut almost to the costae, which are clothed with narrow, bullate, pale scales; segments rather distant, oblong, acute, subserrate, coriaceous-membranaceous; veinlets forked; sori copious, medial; indusium thin, usually splitting first down one side.

Aneitium, Ternate.

31. **Cyathea arachnoidea** Hooker.

Frond tripinnate, firm-coriaceous, glabrous above, cobwebby beneath; axes dark, muricate with short, black, sharp spines, clothed with a rusty tomentum; pinnules 5 to 10 cm long, 12 mm broad, pinnate almost throughout; secondary pinnules 6 mm long, linear, acute, subfalcate; veinlets inconspicuous; sori medial, indusium thin, white, and delicate, breaking into irregular, laciniate segments.

Ternate, Queensland; Java?

32. **Cyathea tripinnata** Copel. in Philip. Journ. Sci. 1 Suppl. (1906) 251.

Trunk 2 to 3.5 m high, 10 cm thick, its apex and the bases of the stipes buried in whitish scales 3 to 5 cm long and 1 mm wide; stipe 60 cm long, like the rachis, dull-purplish-black, scurfy with fine tawny squamules, sparsely beset with sharp spines 1 mm long; frond 2 m long,

1.5 m broad, tripinnate; middle pinnæ the largest, 80 cm long; pinnules 12 cm long, 20 to 25 mm broad, abruptly acuminate; secondary pinnules 12 mm long, 3 mm broad, sessile, cordate or the upper ones adnate, subacute, serrulate, herbaceous, glabrous except for straw-colored scales on the costae and sometimes on the veins; veinlets forked at the base; sori costular, 1.5 mm wide; indusium almost white, very thin, breaking early into persistent, silky fragments.

Luzon, Mindoro, Negros.

33. **Cyathea tomentosa** (Bl.) Zoll. & Moritz.

Trunk 8 m high, 20 cm in diameter, densely clothed at the top with light-brown scales 2 to 5 cm long, as are also the bases of the stipes; fronds up to 2.5 m long, 1.4 m broad, tripinnate; pinnæ subsessile, up to 25 cm broad; rachis of pinna densely hairy above, beneath spinulose, densely clothed with minute lacerate squamules, and bearing copious linear, sparsely ciliate, rufous-fulvous scales almost 2 cm long; pinnules sessile, broadest (15 mm) at the base, gradually acuminate, costæ hairy above, densely clothed beneath with very hairy tawny scales; secondary pinnules adnate, only the lowest ones free, subentire, obtuse, falcate, coriaceous, convex, glabrous above, costule scaly and hairy beneath and the veinlets sparsely hairy; veinlets 8 to 12 on a side, mostly forked; sori costular, covered by scales, exindusiate.

Java.

34. **Cyathea lepifera** (J. Sm.) Copel. (*Alsophila lepifera* J. Sm. in Hook. Journ. Bot. 3 (1841) 419).

This fern has been collected only by Cuming, and has been reduced to *C. tomentosa,* from which it is very distinct. It is much nearer to the next species, *C. crinita,* but has narrower pinnules, cut almost throughout to the costa, the costa less scaly, the secondary pinnules somewhat glaucous beneath, and the long scales on the rachises with few pale marginal setae.

Luzon (Camarines Sur).

35. **Cyathea crinita** (Hook.) Copel. (*Alsophila crinita* Hooker, Icones (1844) pl. 671).

A tall tree; stipe and flexuose main rachis stramineous, rough with minute points and with many black-tipped small spines; rachises pilose above, clothed beneath with lacerate squamulæ and rather deciduous, tawny, acicular scales 1 mm long, more or less, with dark marginal setae; pinnæ 60 cm long, 25 cm broad; pinnules sessile, 25 mm broad at the base, acuminate, cut to the costa at the very base, elsewhere to a narrow wing; costa and costules hairy above, densely clothed beneath with lacerate scales larger than the small ones on the rachis; segments obtuse, falcate, the lowest crenate-lobed, becoming entire upward, coriaceous;

veinlets forked, sparsely hairy beneath; sori inframedial, exindusiate. Beddome calls this "By far the most beautiful of all tree ferns."

India, Ceylon, Java.

36. **Cyathea strigosa** Christ.

Stipe 45 cm long; frond 65 cm long, 40 cm broad, coriaceous; axes aculeate, orange-red, hairy and bearing pale, bullate scales; pinnæ 10 to 12, 20 cm long, the lowest not reduced, sessile; pinnules sessile, acute but not caudate, cut almost to the costa; segments long-triangular, falcate, entire, the margin involute, usually glabrous above; veinlets densely scaly and hairy beneath, forked; sori small, costular, indusium white-scarious. Decidedly alpine in aspect.

Celebes (Wawa Karaeng, from 2,000 m alt. to the summit).

37. **Cyathea zollingeriana** Mett.

Frond coriaceous, dark-green above, pale beneath; rachises above ferrugineous-hirsute and paleaceous; the secondary rachises and costæ beset beneath with fugacious, lanceolate, acuminate scales and persistent, smaller, ovate, denticulate ones; stipe and rachis dark-purple, nodulose beneath, rachis above the base of each pinna bearing a prominent "aerophore;" pinnules 6 cm long, 14 mm wide; segments close, connected by a narrow wing, elongate-oblong, serrate throughout, obtuse, subfalcate, with forked veinlets, and one costular sorus on each side at the base; indusium rigid-membranaceous, ferrugineous-fuscous, at first opening by a small pore, then irregularly torn.

Java.

38. **Cyathea rufo-pannosa** Christ.

Trunk 2 m high, 4 cm in diameter, the upper part covered by a matting of roots, leaf-scars about 13 mm wide and 15 to 22 mm long; bases of stipes and crown of trunk clothed with appressed, narrow, scarious, opaque, chestnut scales, 13 to 14 mm long; stipe up to 55 cm long, red-brown, bearing fine, sharp, black prickles, and covered with a fine rufous scurf, as is the rachis; frond very variable in size, up to 150 cm long and 60 cm or more broad, the lowest pinnæ reduced and deflexed; middle pinnæ up to 37 cm long, 11 cm broad, sessile, the rachis very hairy above, beneath densely clothed with fine, pale, squarrose scales like those on the main axis, and sparse, entire, linear-lanceolate, chestnut ones 4 mm long; pinnules sessile, 55 mm long, 13 mm wide at the base, acute, cut to the costae for half their length; costæ clothed above with brown hairs, and beneath with copious pale-brown, lanceolate scales 1.5 to 2 mm long; segments (or secondary pinnules) hardly 2 mm wide, 5 mm long, obtuse, adnate (except usually the lowest), serrulate toward the apex, glabrous above with salient, wavy costule, beneath bearing pale, bullate scales, and sometimes such as clothe the costa; veinlets about 8 on a side, forked;

sori small; costular; indusium dark, fragile, soon disappearing unless for an irregular base. Fronds whose largest pinnules are less than 3 cm long are sometimes fertile.

Mindanao (Mount Balabac, alt. 1,200 m).

39. **Cyathea heterochlamydea** Copel. in Elmer's Leaflets 2 (1908) 418.

Trunk 3 to 5 m high, 5 to 7.5 cm thick; frond sessile, 1.5 m long, rachis clear-brown, almost glabrous, rough with small pustules; largest pinnæ 30 to 35 cm long, abruptly narrowed below the acuminate apex, rachises chestnut, mottled, asperulous, clothed with minute bullate scales and lanceolate, chestnut ones 2.5 mm long, with dilated bases, both kinds rather deciduous; pinnules subsessile, 7 cm long, 15 mm wide at the base, acuminate, pinnate, costa bearing a few hairs above, and sparse, broadly lanceolate scales 1.5 mm long beneath; segments coriaceous, acute, subfalcate, serrulate toward the apex, 2 to 3 mm wide, separated by sharp sinuses, the lowest segments free and contracted at the base, and a few succeeding ones free but adnate; lamina dark-green above, pale beneath, glabrous; veinlets up to 9 on a side, the lower ones forked, black beneath, pale above; sori costular, on the lower half or two-thirds of the segment, indusium consisting of a single large scale fastened beneath the sorus, and inclosing on the costular side half or more of the sorus. Probably related to *C. Christii* and *C. negrosiana*.

Negros (Horn of Negros, alt. 1,800 m).

40. **Cyathea mitrata** Copel. in Philip. Journ. Sci. Bot. 3 (1908) 354.

Known only from a pinna and part of the rachis. Rachis brown, almost glabrous, minutely scabrous, bearing scar-like aerophores at the bases of the pinnæ and along the angles of the rachis; pinnæ 40 cm long, 15 cm wide, sessile, their rachises sparsely clothed beneath with a scurf of minute scales, and a very few lanceolate ones 2 mm long; pinnules 7 cm long, 15 mm wide, acuminate, cut almost throughout into distinct secondary pinnules; costæ hairy above, bearing two kinds of scales beneath; secondary pinnules linear-oblong, obtuse, the lower ones stalked and deeply lobed, the upper ones crenate, coriaceous, lamina glabrous, black above, brownish-green beneath, margin deflexed; veinlets forked; sori costular, indusium very large and globose, then split like a mitre, or to the base, and very persistent, covering the nether surface.

Mindanao (Mount Malindang, alt. 2,800 m).

41. **Cyathea loheri** Christ in Bull. Herb. Boiss. II 6 (1906) 1007.

Trunk 5 m high; frond 1 m long, 40 cm broad, with pinnæ down to the base of the stipe; middle pinnæ 30 cm long, the lowest reduced to hardly 6 cm; stipe chestnut, rough with minute pustules; rachises and costæ rufous-hairy above, densely scaly beneath, with large, whitish, fimbriate scales and minute, bullate, rufous ones; pinnules 7 cm long, 13 mm

wide, cut to the costa, secondary pinnules rarely contracted at base; 20 pairs of segments and secondary pinnules, 5 mm long, 2.5 mm wide, entire or crenulate; veinlets about 8 pairs, forked at the base; sori large, covering the whole surface, indusium thin.

Luzon (Mounts Banajao and Maquiling).

42. **Cyathea fuliginosa** (Christ) Copel. (*Alsophila fuliginosa* Christ in Bull. Herb. Boiss. **6** (1898) 138. *C. loheri tonglonensis* Christ in Philip. Journ. Sci. Bot. **2** (1907) 180).

Trunk 2 to 5 m high, stout; frond 1 m, more or less, long, about half as wide, varying greatly in size according to exposure; pinnæ sessile, the lower normal ones reduced, and beside these several pairs 4 to 6 cm long near the base of the "stipe;" "stipe" brownish-purple, verrucose, clothed with fine furfuraceous squamules and with dense, harsh, shining, dark-brownish-purple scales, 1.5 to 3 cm long, 1 mm wide at the base, twisted above the middle; rachis brown, beneath verrucose and clothed with a fine scurf and with crinite brown paleæ, above scurfy and bearing lanceolate palæ 1 cm or less long, which are sometimes a uniform brown, sometimes pale-brown with a dark-brown border, sometimes almost white with a brown border; rachises of pinnæ more densely scaly, with (1) minute, bullate scales, (2) larger, usually pale, broadly lanceolate ones, and (3) at least near the base with still larger ones which are dark or have dark borders; pinnules sessile, the largest on a plant varying in length (with the size of the frond) from less than 5 cm to 8 cm, broadest at the base, acuminate, pinnate at least at the base; costæ hairy above, with purplish or whitish hairs, clothed beneath with scales with bullate bases but otherwise variable in form; segments falcate, usually obtuse, varying from entire to crenate-lobed, dark-green above, pale beneath, coriaceous, glabrous except on the costules beneath; veinlets usually about 9 on a side in the largest segments, mostly forked; sori subcostular, small, crowded, but leaving the apices of the segments free; indusium questionable.

The two plants, as recognized by Christ, which are united here, are distinguished by such characters as among tree ferns in general are quite sufficient; but in this case I am satisfied that they are forms of one very plastic species.

Luzon (mountains of Benguet, alt. 1,400 to 2,000 m).

43. **Cyathea inquinans** Christ.

Frond deltoid, very coriaceous, rust-colored; axes unarmed, bearing rust-brown scales of two kinds:—minute, furfuraceous, stellate ones, which extend to the costules, and linear-lanceolate ones 15 mm long, which, reduced in size, extend to the bases of the pinnules; pinnules 6 cm long, cut to the costa, segments serrate; veinlets forked at the base; sori large, rust-red; indusium yellowish, lax, transient. Alpine in aspect.

Celebes (Lompo-Battang, alt. 2,000 m and upward).

44. **Cyathea oinops** Hassk.

Trunk reaching a height of 12 m, 12 to 15 cm thick; stipe 50 cm long, rough, scaly at the base, elsewhere like the rachis, chestnut, clothed with a dense, stellate, wine-colored tomentum, the secondary rachises and costæ bearing this tomentum and also shining, rust-colored scales; frond 140 cm long, 70 cm broad, acute at both ends, tripinnate; pinnæ oblong, acute; pinnules linear-oblong, very acuminate; secondary pinnules linear-oblong, acute, deeply crenate-serrate, bullate, rigid; veinlets forked, sometimes twice; sori in the forks, 12 to 16 to a segment, rust-brown, large, finally confluent and covering all but the apex of the segment; indusium very thin, soon bifid, then lacerate and vanishing.

Java, at altitudes above 2,300 m.

45. **Cyathea javanica** Blume.

Trunk 10 m high; frond 190 cm long, 120 cm broad; rachises rufescent, glabrous or tomentose above, unarmed but the primary rachis rough with minute bristles, secondary rachises paleaceous-tomentose beneath; pinnæ stalked; pinnules lanceolate, acuminate, deeply pinnatifid, costæ bullate-scaly beneath at base; segments linear-subfalcate, obtusely crenulate or entire; veinlets about 8 on a side, mostly forked; sori few, the lowest medial, the upper ones costular; indusium thin, evanescent except for a saucer-shaped base.

Java, Sumatra, commonest below 1,500 m.

46. **Cyathea schizochlamys** Baker.

Fronds ample, tripinnate, firm and subrigid, green on both sides; rachis unarmed, thinly tomentose and clothed with small, linear, acuminate scales; pinnæ 45 cm long, 12 to 15 cm broad, oblong-lanceolate, their rachises densely clothed with small, ovate-lanceolate, cuspidate scales which extend to the costæ and costules beneath; pinnules lanceolate, sessile, 15 to 18 mm broad, narrowed from the middle to the apex, cut to the costa into linear, entire or rarely crenulate secondary pinnules about 2 mm broad, with a distinct space between them; veinlets 9 or 10 on a side, forked at the base; sori costular; indusium membranous, fragile, soon splitting to the base.

Sumatra (Mount Singalan).

47. **Cyathea sumatrana** Baker.

Frond tripinnate; rachises not spiny, but densely clothed with ferruginous tomentum and large, linear, acuminate, red-brown, membranaceous scales; pinnæ 45 to 60 cm long, 12 to 15 cm broad, texture firm, both surfaces green; pinnules lanceolate, sessile, 16 to 18 mm broad, cut to the costa into ligulate, obtuse secondary pinnules 3 mm broad; veinlets 8 to 10 on a side, all but the uppermost once or twice forked; sori crowded,

almost covering the basal part of the secondary pinnules; indusium large, very fragile, breaking up irregularly.

Sumatra (Mount Singalan, above 1,700 m alt.), Java.

48. **Cyathea raciborskii** Copel. nom. nov. (*Hemitelia crenulata* Mett., non *Cyathea*, Blume).

Trunk up to 3 m high, 5 cm thick; frond 140 cm long, 70 cm broad, axes unarmed; pinnæ up to 45 cm long, lanceolate, the lower ones reduced (beside some very reduced ones at the base of the stipe), the rachises straw-yellow or subfuscous, densely hirsute above, beneath beset with fine hairs and sparse, minute, fuscous, subulate paleæ; pinnules cut to the costa, 6 to 10 cm long, the costæ hairy above, beneath bearing minute, bullate scales; segments or secondary pinnules close, oblong or elongate-oblong, subfalcate, obtuse, crenulate or entire, thin, bright green, paler beneath; veinlets evident, 6 to 9 on a side, the lower forked, the upper simple; sori 2 to 4 on a side, costular.

Java, common at middle altitudes about Buitenzorg; ascribed also to Sumatra and the Philippines.

49. **Cyathea lurida** (Blume) Copel. (*Chnoophora lurida* Blume Enumeratio (1828) 244).

Stipe and rachis unarmed but roughish, purplish, densely tomentose above and scaly with thin, ciliate, subulate paleæ, beneath bearing sparse, crisped, lanceolate scales, brown with light margins; pinnæ 30 cm long, short-stalked; pinnules 5 cm long, 10 mm wide, cut almost or quite to the costa into numerous linear-oblong, almost entire, coriaceous segments, costa hairy above, beset beneath with dentate, ovate-lanceolate, imbricate, dull-ferruginous scales, which become shorter and more bullate toward the apices and on the costules; veinlets 5 or 6 on a side, simple or the lowest forked, mostly fertile; sori subcostular, cinnamon-red, indusium none.

Java, Celebes.

50. **Cyathea batjanensis** (Christ) Copel. (*Alsophila batjanensis* Christ in Monsunia 1 (1900) 90).

Trunk 3 m high; frond 1 m or more long; stipe strongly aculeate, glabrous; rachis rough with minute scales, fusco-stramineous; pinnæ 8 to 10 on a side, remote, stalked, 8 to 10 cm long, 6 cm wide, short-acuminate; pinnules remote, cut deeply but not to the costa; segments 6 to 8 mm long, 3 mm wide, serrate, obtuse, coriaceous; veinlets simple, conspicuous; sori small, medial, separate, indusium none.

Batjan (Mount Sibella, up to 750 m alt.).

51. **Cyathea havilandi** Baker.

Stipe stout, bearing copious crisped, brown scales; frond 60 cm long, 22 to 30 cm broad, oblong-lanceolate, tripinnatifid, the lamina sub-coriaceous, glabrous; rachis stout, scaly; pinnæ sessile, the lowest not

reduced, 12 to 15 cm long, 5 cm wide; pinnules crowded, lanceolate, sessile, the lowest ones deeply pinnatifid, costules densely scaly beneath; segments linear-oblong, erecto-patent; veinlets 4 or 5 on a side, simple; sori costular, indusium firm, persistent, smooth, with truncate mouth.

Borneo (Mount Kinabalu, alt. 3,200 m).

52. **Cyathea subglandulosa** (Hance) Copel. (*Alsophila subglandulosa* Hance in Ann. Sci. Nat. V 5 (1866) 253).

Frond ample, herbaceous, tripinnate; base of stipe buried in long, flaccid, linear, light-brown scales, the rachises densely clothed with small, linear, dark-colored scales; lower pinnæ 30 cm long; pinnules lanceolate, pinnatifid, the lower secondary pinnules cut nearly to the costule, ciliate with glandular hairs; veinlets forked; sori copious, indusium none.

Formosa.

53. **Cyathea crenulata** Blume.

Stipe not spiny; frond tripinnatifid or tripinnate, coriaceous; rachis slightly nodulose beneath and bearing a deciduous, yellowish, furfuraceous tomentum; pinnæ almost sessile, up to 50 cm long, 18 cm wide; pinnules mostly 5 to 7 cm long, lanceolate, acuminate, deeply pinnatifid, costæ minutely chaffy; segments linear-falcate, crenulate or subentire, apex obtuse and entire; sori costular, subconfluent, indusium membranaceous, brown, breaking very irregularly.

Java.

54. **Cyathea foxworthyi** Copel. in Philip. Journ. Sci. Bot. 3 (1908) 355.

Trunk 2 m high; frond 150 cm long, bearing reduced pinnæ almost down to the trunk; stipe and lower end of the rachis beset on the under side with close, short, sharp spines, and finely scurfy, on the upper side with very narrow, dark paleæ 0.15 mm long, and bearing scar-like linear-oblong ærophores along the two ridges; rachises of the upper part of the frond and the pinnæ light-brown, beneath almost glabrous and bearing sparse, minute tubercles, above dark-velvety; middle pinnæ 45 cm long, sessile, abruptly narrowed to a pinnatifid apex; pinnules sessile, about 10 cm long, 16 mm broad, narrowed gradually from a base 16 mm wide to the caudate tip, cut almost to the costa; costa hairy above, beneath dark-purple and bearing a few small scales; segments 3 mm wide, linear-oblong, obtuse, the margin everywhere minutely but sharply serrulate; lamina subcoriaceous, glabrous, dark-green above, pale beneath; veinlets about 11 on a side, forked; sori costular, about 0.8 mm in diameter; indusium dark-straw-color, at first complete, then with a small irregular mouth, finally all breaking away.

Luzon (Mount Banajao, alt. 1,200 m).

55. **Cyathea lanaensis** Christ in Philip. Journ. Sci. Bot. 3 (1908) 271.

Frond 65 cm long, 45 cm broad, tripinnatifid, stipe rough with minute tubercles; rachis glabrescent, reddish-brown; middle pinnæ 30 cm long, 8 cm wide, sessile, the lower ones reduced and deflexed; pinnules 6 cm long, 12 mm wide, about 20 on a side, crowded, sessile, cut to a narrow wing, sinuses acute, costæ beneath bearing red-brown, bullate squamules; segments close, about 15 on a side, entire, acute, glabrous, papyraceous, green, paler beneath; veinlets 6 on a side, forked at the base; sori costular, indusium breaking down early to an irregular, spread-out base, receptacle large, globose.

Mindanao (Lake Lanao).

56. **Cyathea korthalsii** Mett.

Pinnæ 45 cm or less long; primary rachis yellow-reddish beneath, with short, ferruginous tomentum above, secondary rachises bearing a few long, flaccid paleæ beneath; pinnules sessile, 5 to 6 cm long, 12 mm wide, oblong, acuminate, costae beneath bearing sparse, bullate, fuscous scales; segments narrowly oblong, obtuse, subfalcate, scarcely serrate, connected by a narrow wing; sori costular, indusium firmly membranaceous, breaking at the top first, then irregularly.

Sumatra, Java, Mindanao, Celebes.

57. **Cyathea hymenodes** Mett.

Frond broadly lanceolate, membranaceous; stipe 17 cm long, densely beset with short spines; rachis subasperous, dark-purple-brown, tomentellous above; middle pinnæ up to 60 cm long; pinnules about 7.5 cm long, oblong, acuminate, sessile, costæ minutely scaly beneath, densely tomentellous above; segments close, oblong-falcate, obtuse, obscurely serrate, 10 mm long, 3.5 mm wide, confluent; veinlets about 9 on a side, mostly forked; sori costular, indusium thin and all but the base transient.

Sumatra.

58. **Cyathea orientalis** Moore.

Trunk 7 m more or less high, 13 cm thick; fronds up to 2.5 m long and 1.3 m broad; stipe short-muricate, bearing long scales at the base; pinnæ on stalks 2 to 4 cm long; pinnules sessile or nearly so, 8 to 10 cm long, 13 mm broad, abruptly caudate-acuminate, pinnatifid almost to the costa, clothed beneath with ferruginous scales; segments linear-oblong, subfalcate, serrate; veinlets 8 to 12 on a side, mostly forked; sori costular, copious; indusium at first globose, after opening cup-shaped, slightly contracted at the top, with an even rim, chestnut-brown.

Java, Celebes.

59. **Cyathea walkerae** (Presl) Hooker.

Stipe unarmed or slightly muricate; frond ample, bi- or tripinnate, thick, very coriaceous; rachises and costæ hairy above, scaly or glabrescent

beneath; pinnæ 45 cm long; pinnules rather remote, 8 to 10 cm long, acuminate, cut nearly or quite to the costa; segments oblong, obtuse, entire or crenulate or slightly lobed; veinlets forked; sori costular, indusium cup-shaped with irregular margin.

Ceylon (center of the island, at the higher altitudes).

60. **Cyathea modesta** (Baker) Copel. (*Alsophila modesta* Baker in Journ. Bot. **18** (1880) 210).

Stipe less than 30 cm long, bearing dark-brown, linear scales 12 mm long; frond 75 to 90 cm long, tripinnate, moderately firm, green and nearly glabrous on both surfaces, except for a few lanceolate scales on the costæ beneath; rachises pubescent but without prickles or scales; pinnæ oblong-lanceolate, the middle ones the largest, 22 to 30 cm long, 5 to 7.5 cm broad, short-stalked, the lowest reduced and longer-stalked; pinnules lanceolate, sessile, 9 to 12 mm broad, cut in the lower part to the costa, above to a narrow wing, into close, ligulate, entire, obtuse segments less than 2 mm broad; veinlets 6 to 9 on a side, simple or forked; sori costular, not reaching the margin, indusium wanting.

Sumatra (Mount Singalan, alt. 1,800 m).

61. **Cyathea melanopus** (Hasskarl) Copel. (*Alsophila melanopus* Hassk. in Hook. Journ. Bot. **7** (1855) 325).

Trunk 2 to 5 m high, its apex and the bases of the stipes bearing large, copious but deciduous, dark-colored paleae; stipes strongly aculeate at the base, above, like the rachis, slightly rough; frond tripinnatifid, ovate-oblong, acute, membranaceous, slightly glaucous beneath, rachis subglabrous; pinnæ elongate-oblong and acute or oblong-lanceolate and acuminate; pinnules linear-oblong, acuminate, deeply pinnatifid; segments linear-oblong, obtuse or subacute, subfalcate, obscurely crenate-serrate; sori costular in the forks of the veinlets, covering one-half to three-fourths of each segment, finally confluent.

Java (Gedeh, alt. 1,200 to 2,400 m).

62. **Cyathea wallacei** (Mett.) Copel. (*Alsophila wallacei* Mett. ex Kuhn in Linnaea **36** (1869) 153).

Frond ample, tripinnatifid, subcoriaceous, green on both sides; rachises stramineous, densely pubescent; pinnæ oblong-lanceolate, 30 to 36 cm long; pinnules stalked, ligulate, 4 to 5 cm long, 9 mm broad, cut to a narrow wing; segments close, ligulate, obtuse, 2 mm broad, obscurely toothed, densely pilose beneath and with a few bullate scales on the ribs; veinlets 4 or 5 on a side, simple; sori costular, indusia none.

Borneo.

63. **Cyathea ferruginea** Christ in Philip. Journ. Sci. Bot. **2** (1907) 181.

Trunk obsolete or up to 2.5 m high, 6 cm in diameter; stipe in acaulescent plants 150 cm long, with a few scales at the base, sparsely spinulose, decidedly spiny in arborescent specimens, upward glabrescent,

shining, chestnut, like the main rachis; fronds of adult (arboreous) plants almost 2 m long, narrowly deltoid; pinnæ 40 cm long, stalks 2 to 3 cm long, remote, acuminate, not reduced at the base, their rachises paleaceous beneath, with not very persistent, rather polymorphous, tawny scales up to 15 mm long, above hairy; pinnules remote, stalked, up to 7 to 10 cm long, and 20 mm wide at the base, long-acuminate with serrate tips, cut to a narrow wing, or in most ample specimens the single lowest segments free and adnate, costae hairy above, beneath bearing copious, more or less persistent, pale-tawny, ovate scales 1.5 mm long; segments falcate, linear-oblong or oblong, usually obtuse, serrulate, thinly herbaceous, glabrous except on the costule beneath, where the scales are smaller, darker, and more bullate than on the costæ; veinlets 6 to 9 on a side mostly forked; sori inframedial or almost costular, hardly 1 mm wide; indusium brown or purplish-brown, soon breaking into large, irregular, persistent fragments.

Palawan (Paragua), alt. 600 to 1,300 m.

64. **Cyathea assimilis** Hooker.

Trunk 6 m high; stipe bright-chestnut, slightly muricate; rachises scaly above, costæ so beneath; frond ample, coriaceous-membranaceous; pinnæ 30 cm long, 10 to 13 cm broad, acuminate, stalked; pinnules cut almost to the rachis; segments 8 to 10 mm long, oblong, obtuse, subfalcate, coarsely toothed; veinlets usually forked; sori medial; indusium complete, very thin, breaking irregularly.

Borneo, alt. 600 m, Celebes.

65. **Cyathea negrosiana** Christ in Philip. Journ. Sci. Bot. 2 (1907) 181.

Trunk 2 to 4 m high; stipe up to 40 cm long, almost black at the base and bearing a few linear-setaceous, brown paleæ 2 cm long, spiny; rachis brown, glabrous or nearly so, rough with sparse, sharp, fine prickles; frond over 1 m long, 50 cm wide; lowest pinnæ reduced, submedial ones largest, more than 30 cm long, remote, sessile, rachises minutely rough, and scurfy or glabrescent beneath; pinnules sessile, remote, acuminate, 7 cm long, 15 mm wide, cut to a narrow wing and at the base to the costa, the secondary pinnules adnate, costæ hairy above, clothed beneath with minute, pale, ovate scales, the costules bearing still smaller ones; segments 2.5 mm wide, 7 mm long, subfalcate or straight, subacute, obscurely crenulate, herbaceous, glabrous, dark-green above, pale beneath; veinlets 8 to 12 on a side, mostly forked near the base; sori costular, small, indusium transient except for basal fragments.

Negros (Mount Silay, alt. 1,000 m to summit).

66. **Cyathea christii** Copel. in Philip. Journ. Sci. 1 Suppl. (1906) 144.

Trunk 3 to 4 m high, 7 cm thick, its apex and the bases of the stipes clothed with dense, harsh, setaceous, dirty-brown scales 15 mm long; stipes bearing a fine deciduous scurf, and sparse prickles 1 to 2 mm long;

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rachis roughish and glabrescent beneath; frond 1.5 to 2 m long, barely tripinnate; lowest pinnæ reduced and deflexed, sometimes running down almost to the trunk, the middle ones the largest, 50 cm long, 12 to 14 cm wide, acuminate, horizontal, subsessile, their rachises very felty above, beneath scurfy with minute, pale, bullate, rather deciduous squamules; pinnules subsessile, lanceolate, acuminate, 7 cm long, cut mostly to a narrow wing, but at the base to the costa, the secondary pinnules adnate, costæ clothed above with dark hairs, beneath with partly deciduous, minute, pale, bullate squamules, which extend to the costules; segments more or less remote but never very close, linear-oblong, subfalcate, denticulate, mostly obtuse, the lamina subcoriaceous, glabrous, dark-green above, paler beneath; veinlets 7 to 9 on a side, mostly forked; sori costular, crowded; indusium breaking at first into large pieces, finally breaking down to a saucer-shaped remnant.

Mindanao, alt. 1,000 to 1,800 m.

67. **Cyathea alderwereltii** Copel. nomen novum (*Hemitelia sumatrana* v.A.v.R. in Bull. Dept. Agr. Ind. Néerl. **18** (1908) 2, not *C. sumatrana* Baker).

Frond subtripinnate, chartaceous; rachis muricate with short, acute warts black at the apex; pinnæ 55 cm more or less long, stalked; pinnules 8 to 12 cm long, about 2 cm wide, linear-oblong short-acuminate, cut at the base to the costa; costae hairy above, beneath densely scaly, as are the costules, scales ferrugineous; segments linear-oblong, subacute, crenate-dentate; veinlets once or twice forked; sori 1 to 4 on a side, subcostular, indusium brown, incomplete.

Sumatra.

68. **Cyathea callosa** Christ (*Alsophila extensa* J. Sm. in Hook. Journ. Bot. **3** (1841) 419, non Desv. nec Blume).

Trunk 1 m high, 8 cm in diameter; stipe stout, dark purple, densely spiny, furfuraceous like the lower part of the rachis, and bearing harsh, shining, dark, narrow paleæ 15 to 20 cm long, the stipe very short because of numerous very reduced pinnæ running down almost to the trunk; rachis glabrescent upward, brown, the spines becoming small and sparse but not quite disappearing; pinnæ up to 50 or 60 cm long, and 20 cm wide, short-stalked, with a small aërophore subtending the attachment of each to the main rachis, rachises beneath like the main rachis, above hairy, as are the slender costæ; pinnules up to 11 cm long and 2.5 cm wide, acuminate or caudate, sessile or subsessile, cut at the base to the costa, the free segments more or less adnate, costa typically with a few small scales beneath, sometimes naked; segments crowded, falcate or subfalcate, linear-oblong, obtuse, serrulate toward the apex, costules usually with a few scales beneath, naked above, lamina glabrous, coriaceous, dark above, pale beneath; veinlets about 11 on a side, forked; sori strictly costular, 1 mm wide, indusium persistent. I have identified this plant from an authentic specimen, rather than by description: it

is perhaps too near to *C. caudata,* the rachis being rougher, the costæ more glabrous, and the indusium constant and persistent.

Luzon (Province of La Laguna, alt. 700 to 1,000 m).

69. **Cyathea halconensis** Christ in Philip. Journ. Sci. Bot. 3 (1908) 270.

Trunk 3 m high; stipe short or almost none because of reduced pinnæ at the base, chestnut, spiny, scurfy, and scaly with dark, harsh, narrow paleæ 1 cm long; rachis shading upward to a rather light reddish-brown, there almost glabrous and the spines reduced to sparse, minute prickles; frond 1 m or more long, hardly half as wide; pinnæ 30 cm long, 13 cm wide, sessile, acuminate, rachises smooth and almost glabrous, light-brown; pinnules up to 7 cm long and 22 mm wide, sessile or subsessile, cut near the base to the costa and the lowest secondary pinnules sessile but usually not adnate, costa hairy above, beneath, like the costules and veinlets, black and glabrous except for a very few lanceolate scales; segments 3 mm wide, obtuse or subacute, serrulate, glabrous, membranaceous, very dark above, pale and almost glaucous beneath; veinlets 7 to 10 on a side, forked near the base; sori in the forks, 1 mm wide, indusium thin, shining-brown, splitting irregularly into large pieces, persistent.

Mindoro, alt. 1,600 to 2,000 m.

70. **Cyathea celebica** Blume.

Frond silky-glaucous beneath, membranaceous; rachis purplish, muricate, furfuraceous; pinnæ more than 30 cm long; pinnules linear-lanceolate, acuminate; secondary pinnules linear-subfalcate, obtuse, crenulate at the apex, truncate and sessile at base; veinlets 10 on a side, forked at the base.

Celebes, Ternate, Batjan.

71. **Cyathea teysmannii** Copel nomen novum (*Cyathea celebica* v.A.v.R. in Bull. Dept. Agr. Ind. Néer. 18 (1908) 2).

Rachis beset with acute spines, furfuraceous; frond ample, tripinnate, subcoriaceous, glabrous, or minutely paleaceous beneath; pinnæ stalked, 50 to 60 cm long, about 20 cm wide; pinnules sessile or the lowest stalked, about 2 cm wide, cut at the base to the costa; secondary pinnules subfalcate, obtuse, crenate, the lowest ones stalked and lobed toward the base, the lobes small, the lowest ones free; lowest veinlets two or three times forked and sterile, middle ones once forked and fertile, upper ones simple and sterile; sori many, covering the segments except at base and apex, indusium thin and evanescent.

Celebes.

72. **Cyathea pustulosa** (Christ) Copel. (*Alsophila pustulosa* Christ in Bull. Herb. Boiss. II 1 (1901) 1019).

Trunk 3 to 4 m high; stipe stout, yellowish, clothed at the base with thin, whitish, subulate scales 1.5 cm long, and, like the rachis, rough with dense, minute prickles; frond 150 cm long, tripinnate; pinnæ up

to 40 cm long, 16 cm wide, long-stalked, their rachises asperous and bearing sparse, minute, lacerate squamules; pinnules crowded, sessile, acuminate, 10 cm long, 12 mm wide, pinnate almost throughout, costæ beneath bearing a few minute, lacerate, whitish scales, glabrous or nearly so above; secondary pinnules 6 mm long, 2 mm wide, separate, mostly adnate, obtuse, subfalcate, crenulate, often with involute margin, subcoriaceous, dull-green, darker above, glabrous above, costule beneath bearing rather large whitish scales; veinlets about 10 on a side, mostly forked; sori infra-medial, on most of the veinlets, covering the lamina, no indusium seen.

Liu Kiu.

73. Cyathea latebrosa (Wall.) Copel. (*Alsophila latebrosa* Wall. in Hooker, Sp. Fil. 1 (1844) 37).

A lofty tree; stipes dark-brown, very spiny, scurfy, and bearing at the base a few linear, harsh, brown scales about 3 cm long; frond very large, lowest pinnæ somewhat reduced and deflexed; rachis maroon, muricate, scurfy with deciduous and very minute squamules; pinnæ up to 60 cm or more long, sessile or nearly so, acuminate, rachises from brownish-yellow to almost maroon, glabrous or minutely scaly, rough with sparse, fine prickles; pinnules sessile, up to 10 cm long, very acuminate, cut to a narrow wing throughout or the lowest segments free, and adnate or not so, costæ sparsely hairy above, bearing small, more or less bullate, sometimes irregular scales beneath; segments subfalcate, obtuse or acute, serrulate or subentire, glabrous except for scales beneath on the costules, subcoriaceous, bright-green above, somewhat paler beneath; veinlets about 11 on a side, forked; sori infra-medial, distinct or finally confluent, each subtended by a brown scale. This is a species originally inadequately described from a Penang fern; Beddome's figure (F. S. I., pl. 58) does not agree completely with the description; and my only Penang specimen under this name seems to be *C. contaminans*.

India to Formosa and Celebes.

C. latebrosa var. *major* Christ in Philip. Journ. Sci. Bot. **2** (1907) 183, has a straw-yellow rachis, and the type collection had the trunk 120 cm high.

74. Cyathea curranii Copel. in Philip. Journ. Sci. Bot. **3** (1908) 356.

Trunk 3 m high, 20 cm thick, the leaf-scars 5 by 3 cm; stipe about 35 cm long, maroon, tuberculate, bearing thin, soft, tawny scales which are up to 63 mm long, entire unless at the tip, long-attenuate, 4 mm wide at the base, cordate, or rounded and peltate; frond about 1 m long, half as wide; rachis bearing sparse, small, deciduous, lanceolate paleæ, rough with small but numerous, usually very blunt tubercles, brown, dorsal surface hairy, secondary rachises similar but less tuberculate, and dark-maroon in color; lowest pinnæ long-stalked, reduced and deflexed; median ones 35 cm long, 17 cm wide, short-stalked; pinnules sessile, 9 cm long, 1 cm wide, long-attenuate, pinnate, costa naked on both sides, almost

black; lowest secondary pinnules deflexed over the rachis and not adnate, the others adnate, crowded, narrowly oblong, obtuse, entire or nearly so, bullate, coriaceous, glabrous and brownish-green above, apparently glaucous beneath, with occasionally a scale on a costule and very minute whitish hairs on the veinlets; veinlets about 10 on a side, simple or forked near the costules; sori subcostular, soon confluent and covering the whole surface, without indusium or subtending scale.

Luzon (Mount Banajao, alt. 2,000 m).

75. **Cyathea calocoma** (Christ) Copel. (*Alsophila calocoma* Christ in Philip. Journ. Sci. Bot. **2** (1907) 182).

Trunk 6 m high; frond 4 m long; stipe densely clothed at the base with straw-white scales up to 4 cm long and 6 mm wide, which are brown at the tip, with ciliate, acicular, brown paleæ about 1 cm long, and with every intermediate form, white with brown borders; rachis stout, dark- or light-brown, spiny beneath, scurfy, especially above; pinnæ 75 cm long, short-stalked, abruptly acuminate, rachises like the main rachis but with a distinct hairy line above; pinnules crowded, sessile or the lower ones stalked, long-acuminate, up to 15 cm long, 15 to 25 mm wide, pinnate in the lower part, and the lowest secondary pinnules short-stalked, costæ with a narrow hairy line above, dark beneath and bearing very few fine, pale scales; segments 2 to 3 mm wide, falcate, rather obtuse, usually entire, glabrous except for a few white squamules and rather long hairs on the nether side of the costules, herbaceous, deep-green above, sub-glaucous beneath; veinlets about 12 on a side, forked; sori medial, 1 mm wide, not reaching the apex, indusium none.

Luzon, Mindoro.

C. calocoma var. *congesta* Christ ibidem, has a more densely and finely spiny rachis, and more coriaceous and very crowded pinnules and segments.

Luzon.

76. **Cyathea caudata** (J. Sm.) Copel. in Philip. Journ. Sci. **1** Suppl. (1906) 144.

Trunk 2 to 3 m high, 4 to 7 cm in diameter; stipe very short because of reduced pinnæ coming down almost to the trunk, almost black, minutely scurfy and bearing harsh, acicular, dark scales, such as extend some 30 cm up the upper face of the rachis, densely spiny; rachis spiny only near the base, very minutely and sparsely roughened above, brown, bearing a deciduous scurf beneath; frond 1.5 m long; middle pinnæ about 35 cm long, subsessile, abruptly acuminate, rachises like the main rachis, but the furfuraceous squamules more persistent; pinnules 7 to 11 cm long, about 2 cm wide, sessile, acuminate or caudate, cut at the base to the costa, elsewhere to a narrow wing, costa dark-hairy above, purplish beneath and minutely and deciduously scaly; lowest secondary pinnules sessile but not adnate; segments serrulate and subfalcate at apex, obtuse, about 3 mm wide, costules naked above, scaly beneath, lamina coriaceous,

glabrous, very dark above, pale beneath; veinlets up to 13 on a side, nearly all forked; sori strictly costular, small, indusium usually represented by a scale, as in *C. latebrosa*.

Luzon, alt. 700 to 1,300 m.

77. **Cyathea elmeri** Copel. (*Alsophila elmeri* Copel. in Elmer's Leaflets 2 (1908) 419).

Trunk 5 to 10 m high, 10 to 15 cm thick; stipe short, densely covered with dark-brown, minutely ciliate-serrate, seta-like scales 25 to 30 mm long and 0.5 mm wide, which also persist on the trunk around the leaf-scars; frond, including stipe, 2 to 3 m long; rachis stramineous beneath, beset with small, sharp spines with black, mammiform bases, scurfy with minute, rather deciduous squamules; pinnæ 60 cm long, 25 cm wide, subsessile, acuminate, rachises tawny beneath, finely prickly and deciduously squamulose; pinnules 13 cm long, 25 mm wide, acuminate, sessile, close, pinnate near the base and the lowest secondary pinnules not adnate, costæ bearing pale hairs above, and beneath two kinds of stramineous scales: minute, bullate ones, ciliate or subentire, and larger, lanceolate ones, strongly lacerate into brown setæ (the latter scales very characteristic); segments subfalcate, obtuse, 3.5 mm wide, serrulate, separated by narrow sinuses, costules beneath bearing sparse, pale, bullate squamules and hairs, lamina glabrous, herbaceous-coriaceous, green on both sides; veinlets 10 to 12 on a side, mostly forked below the middle, with the sori in the forks; sori two-thirds to 1 mm wide, exindusiate. Very like *C. latebrosa* except for the lacerate scales.

Negros (Horn of Negros Mountain, alt. 1,200 m).

78. **Cyathea adenochlamys** Christ in Bull. Herb. Boiss. II 6 (1906) 1008.

Frond coriaceous, pale beneath, 100 cm long by 60 cm wide, or larger; pinnæ subpetiolate, articulate to main rachis, 40 cm long; pinnules 7 cm long, 14 mm wide, cut to the costa, segments about 17 on a side, obtuse or subacute; rachis unarmed, rufous- or fulvous-stramineous, covered with a short pubescence; costæ reddish-pubescent on both sides; veinlets 10 to 12 on a side, black, the lower ones forked, the others simple; sori 5 or 6 on a side, 1 mm wide, costular; indusium pale-green, persistent, densely covered with pale, sessile glands.

Luzon (Rizal Province, Angilog).

79. **Cyathea leucotricha** Christ.

Rachis glabrous, brownish-rufescent, secondary ones beneath bearing long, white hairs; pinnæ crowded, sessile or subsessile, 50 cm long, 18 cm wide, acuminate; pinnules 9 cm long, 18 mm wide, acuminate, cut to the costa, sinuses narrow and acute; segments 10 mm long, 2.5 mm wide, pectinate, falcate, entire or crenulate at the apex, acute, coriaceous, pale beneath but not glaucous; costæ and costules rough with minute, appressed hairs; veinlets forked midway or below; sori in the forks, 1 mm

wide, indusium thinly membranaceous. Near *C. contaminans* in appearance.

Borneo.

80. **Cyathea burbidgei** (Baker) Copel. (*Alsophila burbidgei* Baker in Journ. Bot. **17** (1879) 38).

Rachises smooth and without scales, but those of the pinnæ hairy; pinnules cut to a narrow wing, into ligulate, subentire, obtuse segments 2 mm wide, costæ strongly ciliate beneath; veinlets 4 or 5 on a side, simple or forked; sori medial, indusium wanting. Allied to *C. latebrosa, C. Oldhami* and *C. Wallacei.*

North Borneo.

81. **Cyathea albosetacea** (Bedd.) Copel. (*Alsophila albosetacea* Beddome, Suppl. (1876) 2).

Main rachis purplish, muricate, and (in age) only slightly scaly; pinnæ long-petioled, their rachises very scaly; pinnules with the one or two lowest segments free, elsewhere cut nearly to the costa; segments oblong, subfalcate, slightly crenate; costæ sparingly clothed beneath with long, white, setaceous hairs, which are also present in a less degree on the costa and costules above, costules beneath furnished with deciduous, bullate scales which often have a hyaline, setaceous point at the apex (resembling the indusium of *Cystopteris fragilis*); veinlets all forked near the base, one branch often and both very rarely again forked; sori copious, indusium wanting. The position of this plant is uncertain because of incomplete diagnosis; it is reduced by Diels to *C. latebrosa.*

Nicobar Islands.

82. **Cyathea chinensis** Copel. in Philip. Journ. Sci. Bot. **3** (1908) 355.

Trunk 6 m high; rachis almost glabrous, not prickly; pinna of type specimen 42 cm long, 13 cm wide, sessile, acuminate, its rachis stramineous, clothed above with purplish-brown hairs and beneath with sparse hyaline hairs; costæ similarly pubescent, but more densely beneath, and toward the tip with a few irregular squamules; pinnules sessile, 7 cm long, 14 mm wide, caudate with the apex serrate, cut almost to the costa; segments obtuse, subfalcate, 3 mm wide, serrulate, herbaceous, green on both sides, but somewhat paler beneath, the lamina glabrous but the costule bearing some hairs and squamules beneath; veinlets 7 to 9 on a side, mostly forked, inconspicuous; sori costular at the bases of the segments, small, each subtended by one or two brown scales.

China (Yunnan, in the Szemao forest, alt. 1,800 m).

83. **Cyathea trichodesma** (Scort.) Copel. (*Alsophila trichodesma* Schort. ex Bedd. in Journ. Bot. **25** (1887) 321).

Trunk of moderate size, slender; stipes scaly at the base; frond 120 to 180 cm long, bipinnate; rachis rough above, clothed with appressed, spreading, semi-viscous, copious, jointed hairs; pinnæ lanceolate, 60 to 75

cm long, 15 to 20 cm broad, their rachises stramineous, clothed like the main rachis; pinnules 8 cm long, 18 mm wide, thinly herbaceous, the lamina, costa and veinlets clothed on both sides with the same hairs as the rachis, cut nearly to the costa into linear, obtuse, crenulate, rather distant segments; veinlets 7 or 8 on a side, forked; sori 5 or 6 on a side, medial, indusium none. Near *C. Andersoni,* of Sikkim.

Perak.

84. **Cyathea cyclodonta** (Christ) v. A. v. R. in Bull. Dept. Agr. Ind. Néerl. 18 (1908) 1.

Rachis naked, brownish-green, shiny; primary pinnules 10 cm long, 25 mm wide, about 35 pairs, cut to the costa, costa finely puberulous above, strigose beneath; secondary pinnules 2 to 3 mm apart, decurrent or subauriculate on both sides, linear, 12 mm long, 2.5 mm wide, coarsely crenate with about 12 lobes on a side, coriaceous, glabrous, dark-green on both sides; veinlets forked at the base; sori in the forks, about 8 on each side, over 1 mm wide; indusium membranaceous, breaking down to an irregular brown cup.

Borneo.

85. **Cyathea andersoni** (Scott) Copel. (*Alsophila andersoni* Scott: Bedd. Ferns. Brit. Ind. (1869) 310).

Stipe ebeneous, muricate, clothed especially near the base with lanceolate, deciduous scales; rachises dark-chestnut, naked beneath and rough with raised points, tawny-villous above; pinnæ oblong-lanceolate, 45 to 60 cm long; pinnules lanceolate-ligulate, 10 to 15 cm long, about 2 cm wide, subsessile, cut nearly or quite to the costa, costa bristly, especially beneath, not scaly; segments close, 3 to 4 mm wide, lanceolate, bluntish, toothed, green on both sides, texture thin but firm; veinlets 9 to 12 on a side, forked; sori infra-medial, minute, exindusiate.

Sikkim, alt. 300 to 650 m.

86. **Cyathea kingii** (Clarke) Copel. (*Alsophila kingii* Clarke in Bedd. Handbook, Addenda).

Trunk 3 m high; main rachis purplish, shining, glabrous, rachises of pinnæ purplish, glabrous, and somewhat glaucous; pinnæ 45 to 60 cm long; pinnules about 7 cm long, 12 mm wide, coriaceous, of a bluish-glaucous tint, the costa very scaly beneath and hairy above, pinnules cut nearly to the costa into oblong, crenate segments; costules much raised and very prominent (particularly in the fertile pinnules) and scaly; veinlets once forked a little above the base, or more rarely simple; receptacle very prominent, indusium wanting. Baker puts this species *near C. latebrosa,* and says *A. Bakeri* Zeiller is probably a synonym.

Perak (Larut), alt. 1,500 m.

87. **Cyathea brunoniana** (Wall.) Clarke & Baker.

A large tree; main rachis prickly; secondary rachises slightly prickly or smooth and glabrous; costa sparsely and deciduously crisped-pubescent beneath, naked or nearly so above; segments minutely hairy on the veinlets, the fertile ones not contracted, 15 to 18 mm long, 3 mm wide, entire, obtuse, coriaceous, glabrous, somewhat glaucous beneath; veinlets about 13 on a side, forked, nearly all fertile; sori costular; indusium at first globose and complete, soon breaking down to an irregular cup.

Northern India.

88. **Cyathea decipiens** (Scott) Clarke & Baker.

Trunk 15 m high; stipes spiny, mahogany-brown and scaly at the base, pale-brown and furfuraceous upward; rachises very prickly; pinnæ sessile, ample, acuminate; pinnules 10 to 12.5 cm long, 2 cm wide, sessile, acuminate, cut nearly or quite to the costa, costæ and costules bearing bullate scales; segments not close, 2 mm wide, acute, subfalcate, serrate, subcoriaceous, dark-green above, gray-green beneath but not glaucous; veinlets 10 to 12 on a side, two to four times forked; sori costular, small; indusium at first complete and spherical, fragile. Specimens in cultivation have been mistaken for *C. spinulosa,* and Beddome implies that he can distinguish them only by the indusium.

Northern India, alt. 600 m.

89. **Cyathea spinulosa** Wall.

A tall tree-fern; stipe and rachis purple, very spiny beneath, rachises rusty above; frond 3 m long; pinnæ stalked, abruptly acuminate; pinnules subsessile, 8 cm long, acuminate, cut almost to the costa; costa hairy above, beneath bearing small bullate scales, as do the costules, which are glabrous above; segments close, acute, subfalcate, serrulate, the lamina glabrous, thin; veinlets 8 to 10 on a side, forked; sori costular, small, numerous, but not reaching the ends of the segments; indusia at first complete, breaking into large pieces, finally disappearing.

India (altitude up to 1,000 m), to Malaya and Japan.

90. **Cyathea mearnsii** Copel. in Philip. Journ. Sci. Bot. 3 (1908) 356.

Trunk 5 cm thick, thinly clothed at the top with black roots; bases of stipes bearing thin, gray-brown, narrow scales 15 mm long; rachis 1 cm thick, tawny, everywhere glabrous, unarmed; pinnæ up to 60 cm long, 25 cm wide, sessile, their rachises smooth beneath, above clothed, like the costæ, with a dark, close pubescence; pinnules sessile, very acuminate, horizontal, up to 29 mm wide at the base, cut at the base to the costa, elsewhere to a narrow wing, costa reddish beneath, bearing some fine furfuraceous scales; segments falcate-acute, serrate, 3 to 4 mm wide, glabrous except for occasional squamules on the costules beneath pale beneath and

not very dark above, coriaceous, lowest secondary pinnule often dilated and pinnatifid; veinlets about 13 on a side, forked; sori costular, crowded but not reaching the apices of the segments, 1 mm or less wide, indusium splitting into large pieces and only the lower part persistent.

Luzon (in the mountains of Benguet).

91. **Cyathea saccata** Christ.

An alpine dwarf; frond 115 cm long, 80 cm wide, stipe 25 cm long; stipe and rachis minutely verrucous, glabrous, rufous-stramineous, shining; pinnæ remote, stalked, 30 to 40 cm long, 12 cm wide, caudate, narrowed at base; pinnules remote, 6 cm long, 15 mm wide, lanceolate, pinnate, costæ black, beset above with minute brown scales; secondary pinnules 13 or 14 on a side, separate, 2.5 mm wide, dentate; veinlets 9 to 12 on a side, forked, conspicuous; sori medial, indusium pellucid.

Celebes (Mount Topapu, alt. 1,300 to 1,700 m).

92. **Cyathea runensis** v.A.v.R. in Bull. Dept. Agr. Ind. Néerl. **18** (1908) 1.

Rachis unarmed, setaceous above; pinnæ about 55 cm long, 22 to 25 cm broad; pinnules sessile, acuminate, 2 to 2.5 cm wide at the base, pinnatifid; segments oblong, subfalcate, subobtuse, crenate, margin slightly decurved; veinlets about 8 on a side, the lower ones forked; sori medial, numerous, indusium breaking into irregular fragments; frond ample, coriaceous, glabrous. The proper place of this species is uncertain because of incomplete description.

Pulo Run.

93. **Cyathea leucophaes** Hassk.

Trunk 3 to 5 m high; stipe and rachis spiny; frond tripinnatifid, coriaceous, glabrous, becoming whitish above as it dries; pinnæ oblong-lanceolate, acuminate, mostly stalked; pinnules linear-oblong, acuminate, unequally truncate at the base, deeply pinnatifid; segments linear-oblong, acute, serrate-crenate at the apex and the margin reflexed; veinlets forked, with the globose sori in the forks; indusium membranaceous, hyaline, globose, soon irregularly torn, and finally vanishing.

Java.

94. **Cyathea junghuhniana** (Kze.) Copel. (*Alsophila junghuhniana* Kze. in Bot. Zeit. **6** (1848) 284).

Frond bright-green above, pale beneath, axes unarmed; rachises stramineous or fuscous, hirsute above as are also the costæ, beneath smooth or minutely nodulose; pinnules 11 cm long, 16 to 20 mm wide; segments close, connected by a narrow wing, linear-oblong, subfalcate, obtuse, repand or serrulate; costæ beneath bearing sparse, minute, ovate, appressed, pale-ferruginous scales, glabrescent; veinlets evident, lax, 6 to 9

on a side, forked at the base; sori costular; indusium scale-like, minute. *Hemitelia manilensis* Presl is described as a species resembling this, found in Luzon.

Java, Sumatra.

95. **Cyathea mertensiana** (Kze.) Copel. (*Alsophila mertensiana* Kze. in Bot. Zeit. 6 (1848) 586).

Rachis glabrescent, verrucous with shining, brown warts; pinnæ long-stalked; pinnules approximate, short-stalked, oblong-lanceolate, acuminate, deeply pinnatifid, costæ glabrous above, at base beneath bearing sparse, white, bullate scales; segments falcate, rather obtuse, margin reflexed and obscurely serrulate, the fertile segments contracted and the lowest free but adnate; veinlets forked, usually twice, white-hairy; sori minute, crowded, occupying the entire segments; indusium a cup-shaped basal scale.

Bonin.

96. **Cyathea ornata** (Scott) Copel. (*Alsophila ornata* Scott in Bedd. Ferns Brit. Ind. (1870) 342).

Frond ample, tripinnate, moderately firm in texture; rachises castaneous, smooth, naked beneath; pinnæ stalked, oblong-lanceolate, 45 to 60 cm long; pinnules sessile, lanceolate, 8 to 10 cm long, 18 to 24 mm wide, costæ scaly, especially beneath; segments close, ligulate, obtuse, denticulate, 2 mm wide, green on both sides, without scales or hairs; veinlets 8 to 12 on a side, forked; sori minute, subcostular, exindusiate. *Alsophila Oldhami* Bedd. is usually regarded as this species; but as figured by Beddome it differs in having long-stalked pinnæ and the costules scaly beneath.

Sikkim, alt. 750 m.

97. **Cyathea clementis** Copel. (*Alsophila clementis* Copel. in Philip. Journ. Sci. 1 Suppl. (1906) 143).

Trunk 9 m high, stout; stipe brown at the base, shading to stramineous in the rachis, clothed at the base with linear, whitish scales 5 to 15 mm long, exceedingly rough with blackish, stout, sharp spines 4 to 5 mm long; rachis glabrous, beset with smaller spines; frond 100 to 150 cm long, ovate; middle pinnæ 30 to 40 cm long, their rachises rough; pinnules 6 to 8 cm long, 15 mm wide cut at the base to the costa, elsewhere to a narrow wing, costæ above bearing dirty-white hairs or nearly naked, beneath naked or sparsely furfuraceous-squamulose; segments subfalcate, entire, obtuse, coriaceous, glabrous, greenish-brown above, paler beneath but not glaucous; veinlets forked, about 10 on a side; sori infra-medial, naked, receptacles evidently paraphysate.

Mindanao (Lanao).

98. **Cyathea fauriei** (Christ) Copel. (*Alsophila fauriei* Christ in Bull. Herb. Boiss. II 1 (1901) 1019).

Rachises bearing short, sharp pustules, main rachis pale-brown, plant smooth; pinnæ sessile (at least the upper ones), 40 cm long, 16 cm wide, ovate-oblong, acuminate; pinnules sessile, about 18 below the pinnatifid apex, acuminate, 9 cm long, 2 cm wide, not cut to the costa; segments subfalcate, broadly linear, obtuse or apiculate, almost in contact, 2.5 to 3 mm wide, evidently serrate, dark-green above, olive beneath, herbaceous; veinlets conspicuous, 12 or more on a side, black, two or three times forked; sori costular at bases of segments, large and few, brown, naked, receptacle small and naked.

Liu Kiu (Oshima, common at foot of mountain).

99. **Cyathea confucii** (Christ) Copel. (*Alsophila confucii* Christ in Ac. Geog. Bot. 15 (1906) 102).

Trunk hardly 2 m high; frond 150 cm long, half as wide; rachises glabrous, beneath prickly, light-brown; pinnæ sessile, 45 cm long, 15 cm wide, acuminate, hardly narrowed at the base; pinnules sessile, caudate with serrate tip, 8 cm long, 17 mm wide, cut almost to the costa, costa bearing dark, appressed hairs above, and very sparse hyaline squamules beneath, the latter being also on the costules; segments acute, falcate at the tip, serrulate, 3 mm wide, dark-green above, pale beneath, herbaceous, the lamina glabrous; veinlets 8 to 12 on a side, mostly forked; sori costular, subtended by a minute, whitish, scale-like membrane.

China (Sze Chuen, Mount Omi, alt. 2,000 m).

100. **Cyathea contaminans** (Wall.) Copel. (*Alsophila contaminans* Wall. Cat. (1829) no. 320; *Chnoophora glauca* Bl. 1828, not *Cyathea glauca* Bory).

Trunk up to 15 m high, 15 cm in diameter; fronds up to 3 m long or even longer, 150 cm wide; stipe 50 to 100 cm long, at the base scurfy and densely clothed with shiny-white, linear scales 2 to 3 cm long, which diminish upward and soon disappear, stipe reddish, shading upward to tawny or almost stramineous on the rachises, like which it is spiny and glabrous; pinnæ up to 85 cm long, stalked, abruptly acuminate; pinnules sessile, usually 11 to 13 cm long, gradually long-acuminate, cut at the base to the costa (and the secondary pinnules contracted at base), elsewhere to a narrow wing, costa glabrous beneath, above bearing whitish hairs, at least near the base; segments linear-oblong, subfalcate, subacute, entire or nearly so, herbaceous, glabrous, more or less glaucous beneath; veinlets 9 to 12 on a side, forked; sori medial or infra-medial, not reaching the apices of the segments, indusium none.

India and Malaya. The commonest and largest tree-fern in this part of the world.

101. **Cyathea fenicis** Copel. Philip. Journ. Sci. Bot. **3** (1908) 354.

Trunk 9 cm thick, said to be but 1 m high; stipe 60 cm long, dark-brown, prickly with short, sharp spines, bearing two small, simply pinnate pinnæ just above the base, and clothed at the base with a few narrow, brown scales 15 mm long, otherwise glabrous, as are the slightly roughish rachises; largest pinnæ 35 to 40 cm long, 20 cm wide, abruptly narrowed to a pinnatifid apex; pinnules about 10 cm long, hardly 2 cm broad, sessile, cut at the base to the costa, elsewhere to a wing, costa hairy above, mostly glabrous beneath; segments 4 mm broad, obtuse, obscurely serrulate, costules bearing a few small scales beneath, lamina glabrous, thin, dark-green above, olive beneath; veinlets forked; sori globose, less than 1 mm wide, pale, costular, exindusiate.

Batanes Islands (Santo Domingo de Basco).

DOUBTFUL SPECIES.

Alsophila saparuensis v.A.v.R. in Bull. Dept. Agr. Ind. Néerl. **18** (1908) 2.

Fronds ample, tripinnatifid, firm but not rigid; stipe prickly, clothed with deciduous yellow or brown indument; rachis rough beneath, fibrillose above; middle pinnæ the largest, about 45 cm long, 12 to 16 cm wide, lanceolate, acuminate; pinnules sessile, the lowest ones horizontal, the middle ones the largest, about 15 mm wide; segments crowded, obtuse, crenate or dentate at the apex; sori medial; indusia false, of minute, round, flat scales.

Saparua.

Alsophila bongardiana Mett.

Differs from *C. extensa* in having the "segments broader, entire, rather glaucous below, with copious scattered scales, veins more distant and obscure." It has the aspect of *C. contaminans.*

Bonin.

Alsophila khasyana Moore.
Khasya.

Alsophila xantholepis Christ.
Batjan.

Hemitelia capensis R. Br.
Reported in Java by Blume, Enumeratio 247, probably by mistake.

2. **BALANTIUM** Kaulfuss.

Caudex erect, but usually not rising much above the ground; fronds 3 or 4 times pinnate, deltoid, the ultimate pinnules oblique, more developed at the base on the acroscopic side; fertile and sterile pinnules alike, the fertile teeth not coriaceous; annulus usually oblique and uninterrupted. A small genus with one species in Polynesia, one in Australia, two in this

region, one in the Azores, etc., and one in tropical America. It is very nearly related to *Dennstaedtia* and *Dicksonia*—so nearly that they would all as well be included in *Polypodiaceæ*. The discontinuous distribution and its intermediate position between two families mark it as a very old genus.

Sori in the sinuses..... 1. *B. javanicum*
Sori on the teeth..... 2. *B. copelandi*

1. **Balantium javanicum** (Bl.) Copel. (*Dicksonia javanica* Bl. Enum. 240).

Caudex arborescent (teste Raciborski); frond quadripinnate, up to 1.5 m long and 60 cm wide, axes densely appressed-pubescent, pinnæ and pinnules ovate-oblong, very acuminate; secondary pinnules short-stalked; tertiary pinnules sessile with cuneate base, up to 1 cm long and half as wide, deeply cut into segments 1 to 2 mm wide, hairy beneath with white hairs, sparsely hairy above; sori small, in the sinuses, submarginal. Van Alderverelt states that the annules is vertical; which is not an unknown condition elsewhere in *Balantium*.

Java, at middle elevations.

Dennstaedtia Formosae Christ is similar to *B. javanicum*, but the stem of the plant is unknown.

2. **Balantium copelandi** Christ in Philip. Journ. Sci. Bot. 3 (1908) 301. (Plate XIX.)

Similar to the preceding species, but the sori placed on minor teeth, and marginal, and the tertiary pinnules usually narrower. The caudex usually does not rise above the ground, but may reach at height of 60 cm the fronds, exclusive of stipe, are 50 cm to 3 m long.

Luzon, Negros.

3. DICKSONIA L'Héritier.

Tree-ferns, with 2 or 3 times pinnate fronds; pinnules equal-sided, the sterile ones in our species decidedly reduced; indusium and corresponding leaf-margin more or less coriaceous. A genus of 17 recognized species, chiefly in the southern hemisphere. *Dicksonia* is properly the name of the preceding genus. I should have used it in that way except that this genus has no tenable name.

Dicksonia blumei (Kze.) Moore. (Plate XX.)

Trunk up to 6 m high and 20 cm in diameter; its crown and the bases of the stipes densely clothed with golden acicular scales, becoming brown on the stipes; stipes up to 80 cm long; fronds up to 3 m long, usually less, tripinnate; rachises densely pubescent; pinnæ up to 80 cm long; pinnules up to 12 cm long, about 2 cm wide almost horizontal; secondary pinnæ adnate, narrowly oblong, obtuse, coriaceous, the sterile ones toothed, dark green and shining above, paler beneath, and hairy on the costa;

fertile pinnæ lobed almost to the costa; lobes about four on a side, each almost entirely occupied by a large sorus.

Java, Celebes, Mindanao, Negros, Mindoro, at middle elevations (1,000 to 2,000 m).

4. CIBOTIUM Kaulfuss.

Caudex stout and erect, sometimes arborescent, the apex densely imbedded in brown or golden chaff; fronds large, tripinnatifid or tripinnate; sori marginal on the lower part of the segments, at the apices of veins, the fertile tooth like the indusium, brown and coriaceous, the two inclosing the young sorus; annulus complete, but with a stomium of distinct cells. About 12 recognized species, in and near Central America, in the Hawaiian Islands, and here. I follow Dr. Christ in the treatment of our species.

Sori 2 or more on each side of the segments.
Pinnules 2 cm or more wide.
Sori 2 to 4 on a side, not prominent..... 1. *C. baranetz*
Sori 5 or 6 on a side, prominent..... 2. *C. assamicum*
Pinnules 8 mm wide..... 3. *C. sumatranum*
Sori 1 on each side of the segments..... 4. *C. cumingii*

1. Cibotium baranetz (L.) J. Sm.

Larger pinnules 2 cm wide; stalked, narrowly lanceolate, long-acuminate at the base cut very nearly or quite to the costa, costa more or less hairy; segments lanceolate, falcate, acute, about 1 cm long, subentire or somewhat serrate, decidedly glaucous beneath, separated by narrow sinuses; veinlets mostly simple; sori usually 2, sometimes 3 or 4 on each side, not prominent, 1 mm wide, the lowest oblique, the others parallel to the segment, the outer valve of the indusium the larger and more convex. The caudex is erect and stout but usually not arborescent.

Liu Kiu across China to Malacca and northeastern India; Java (?).

2. Cibotium assamicum Hook.

Pinnules up to 25 mm wide; larger segments 15 mm long, evidently serrate; sori prominent, borne on teeth, up to 6 on a side; valves more unequal, and texture of whole plant rather thinner than in *C. Baranetz,* which it resembles except as just noted. A plant in cultivation at Buitenzorg agrees perfectly with this species as described, except in not being glaucous beneath.

Assam, Tonkin.

3. Cibotium sumatranum Christ in Philip. Journ. Sci. Bot. 2 (1907) 118.

Fertile pinnules only 8 mm wide, cut to a wing 1 mm wide; segments 3 mm long, obtuse, denticulate, separated by obtuse sinuses; sori 2 or rarely 3 on a side, 0.5 to 0.7 mm wide, not prominent, valves subequal; plant glabrous or nearly so.

C. Baranetz var. *setosum* v.A.v.R. has the axes densely clothed with spreading bristles which in falling off, leave them roughish; sori 1 or 2 on a side; indusium fulvous.

Sumatra (Linggalang volcano).

4. **Cibotium cumingii** Kunze. (Plate XXI.)

Like *C. Baranetz,* but the pinnæ usually narrower, the segments shorter and proportionally broader, the veinlets forked, with but one sorus on each side. From Formosa and Fokien I have intermediate forms. *C. Baranetz* var. *lampongense* v.A.v.R., of Sumatra, seems to be like some of the Philippine specimens.

Luzon, Mindoro.

ILLUSTRATIONS.

[Photographs by E. Cortes.]

PLATE I. A, *Ophioglossum intermedium* Hook. B, C, *Ophioglossum pedunculosum* Desf.
II. *Botrychium japonicum* (Prantl) Underw.
III. *Helminthostachys zeylanica* (L.) Hook.
IV. *Angiopteris cartilagidens* Christ.
V. *Macroglossum alidae* Copel.
VI. *Archangiopteris henryi* Christ.
VII. *Marattia ternatea* deVriese.
VIII. *Christensenia cumingiana* Christ.
IX. *Marsilea crenata* Presl.
X. A, *Salvinia natans* (L.) All. B, *Azolla africana* Desv.
XI. *Osmunda regalis* L., var. *japonica* (Thunb.).
XII. *Lygodium merrillii* Copel.
XIII. A, *Schizaea dichotoma* (L.) Smith. B, *Schizaea digitata* (L.) Sw.
XIV. *Gleichenia laevissima* Christ.
XV. *Ceratopteris thalictroides* (L.) Brongn.
XVI. *Matonia foxworthyi* Copel.
XVII. *Phanerosorus sarmentosus* (Baker) Copel.
XVIII. *Cyathea atropurpurea* Copel.
XIX. *Balantium copelandi* Christ.
XX. *Dicksonia blumei* (Kze.) Moore.
XXI. *Cibotium cumingii* Kze.

PLATE I. A, OPHIOGLOSSUM INTERMEDIUM HOOK. B, C, OPHIOGLOSSUM PEDUNCULOSUM DESF.

PLATE II. BOTRYCHIUM JAPONICUM (PRANTL.) UNDERW.

PLATE III. HELMINTHOSTACHYS ZEYLANICA (L.) HOOKER.

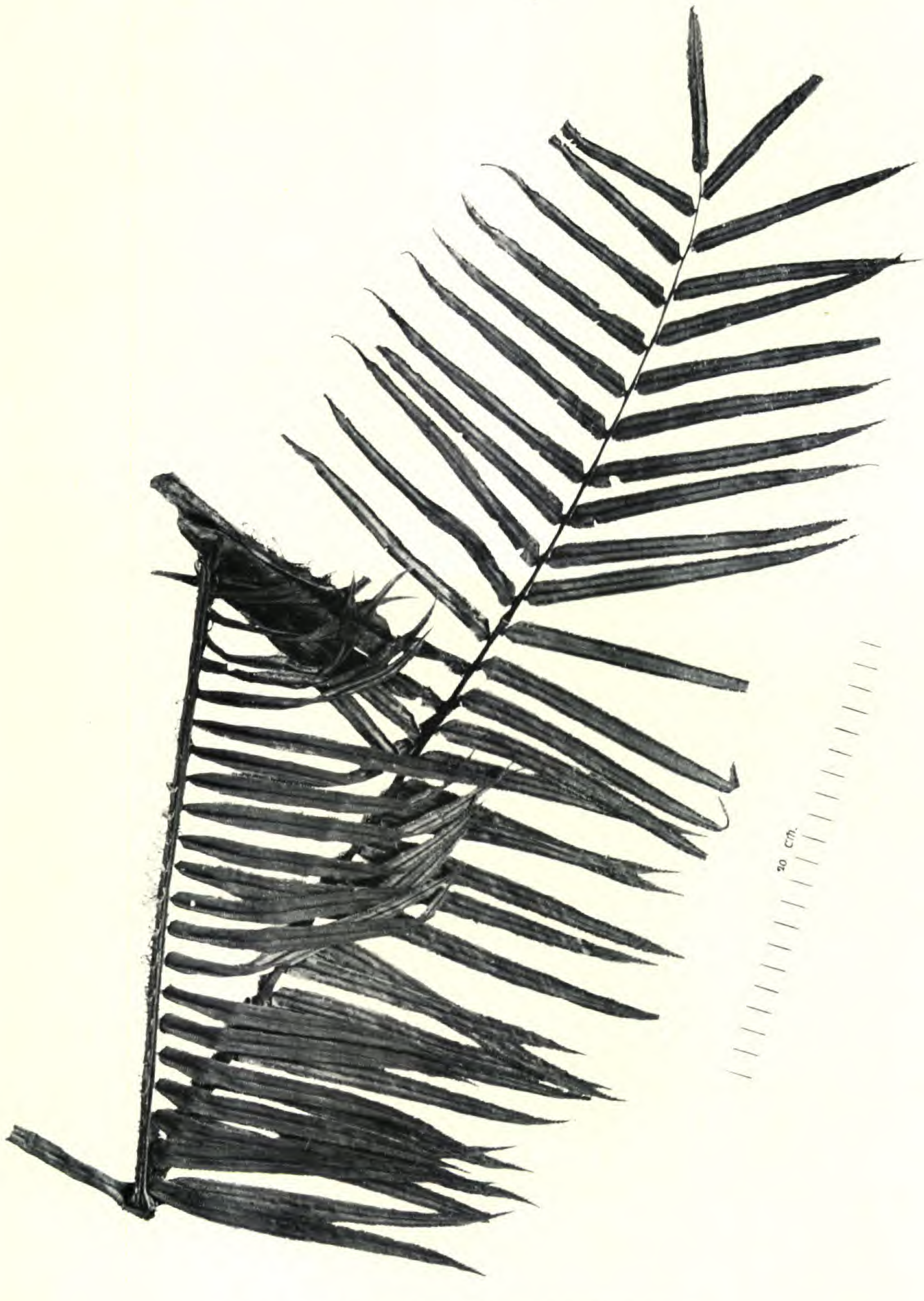

PLATE IV. ANGIOPTERIS CARTILAGIDENS CHRIST.

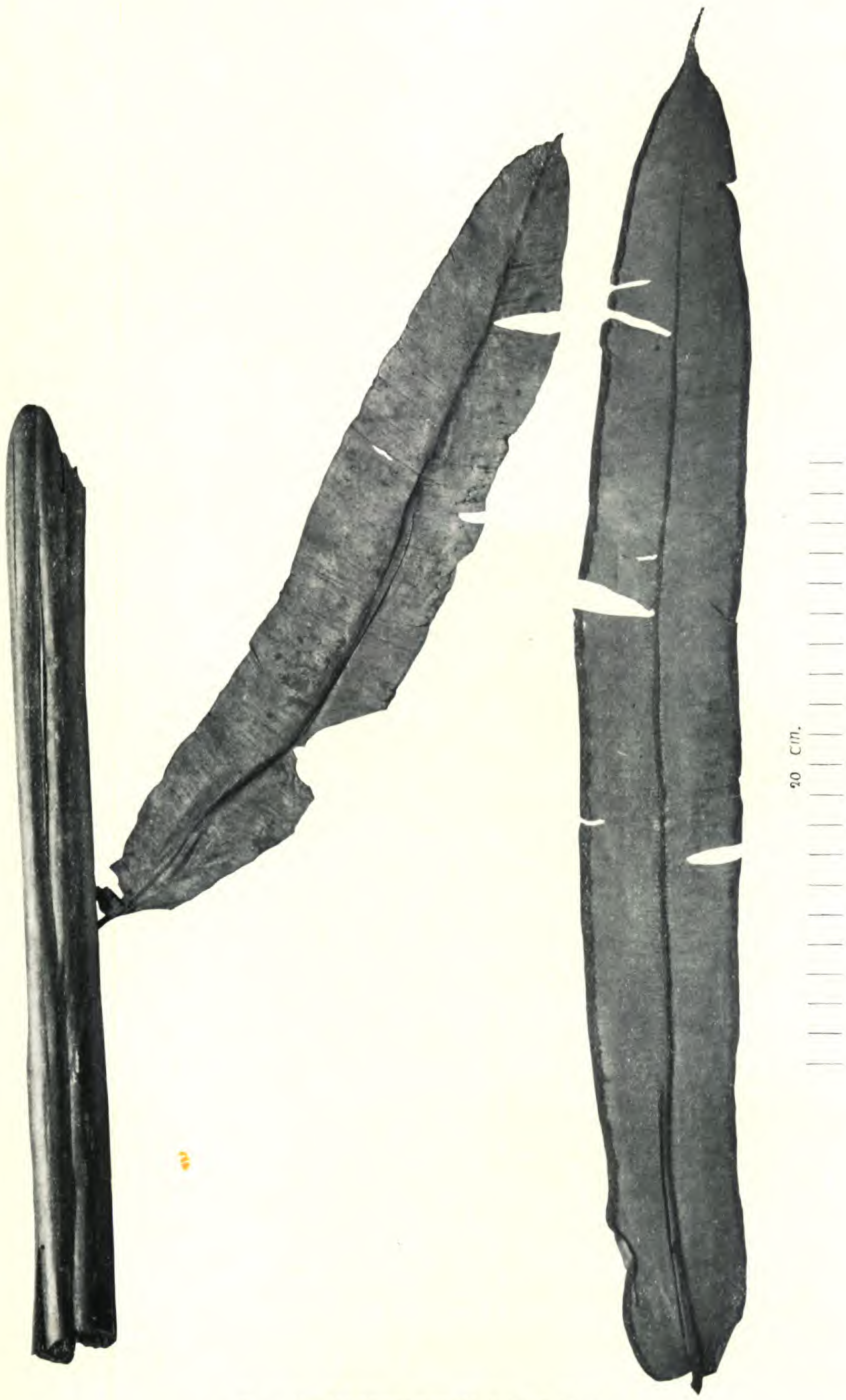

PLATE V. MACROGLOSSUM ALIDAE COPEL.

PLATE VI. ARCHANGIOPTERIS HENRYI CHRIST.

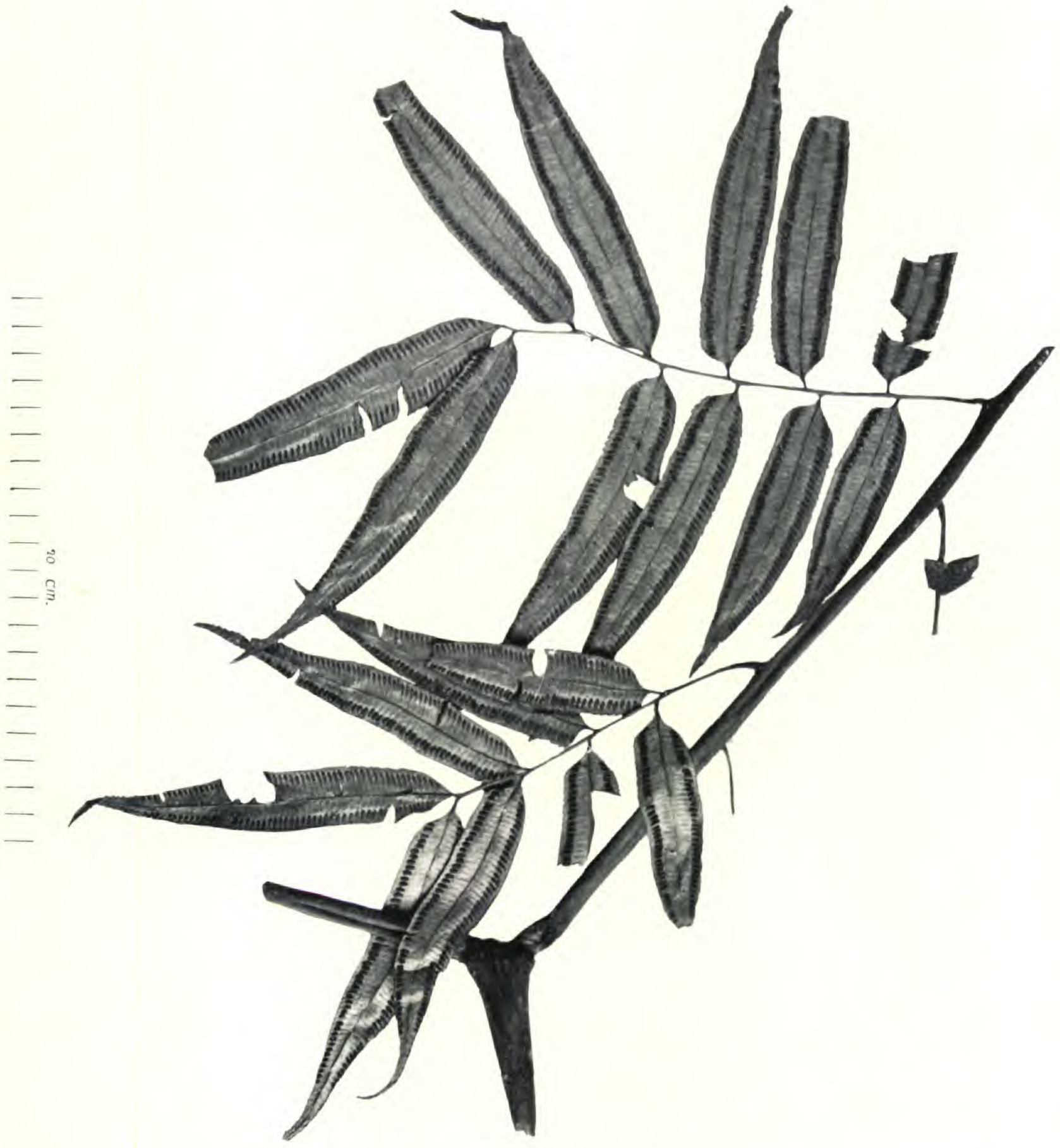

PLATE VII. MARATTIA TERNATEA DE VRIESE.

PLATE VIII. CHRISTENSENIA CUMINGIANA CHRIST.

PLATE IX. MARSILEA CRENATA PRESL.

PLATE X. A, SALVINIA NATANS (L.) ALL. B, AZOLLA AFRICANA DESV.

PLATE XI. OSMUNDA REGALIS L., VAR. JAPONICA (THUNB.).

PLATE XII. LYGODIUM MERRILLII COPEL.

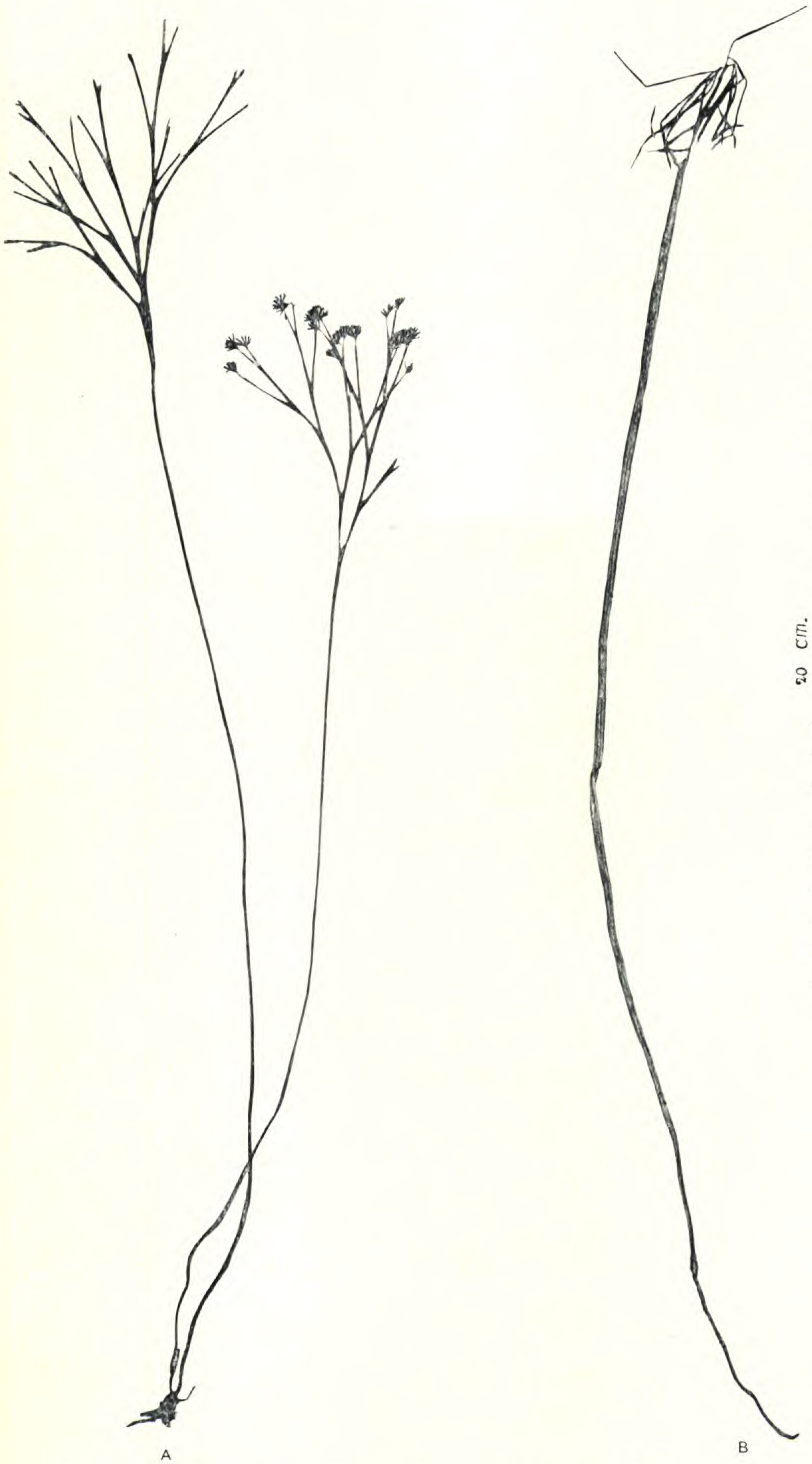

PLATE XIII. A, SCHIZAEA DICHOTOMA (L.) SMITH. B, SCHIZAEA DIGITATA (L.) SW.

PLATE XIV. GLEICHENIA LAEVISSIMA CHRIST.

PLATE XV. CERATOPTERIS THALICTROIDES (L.) BRONGN.

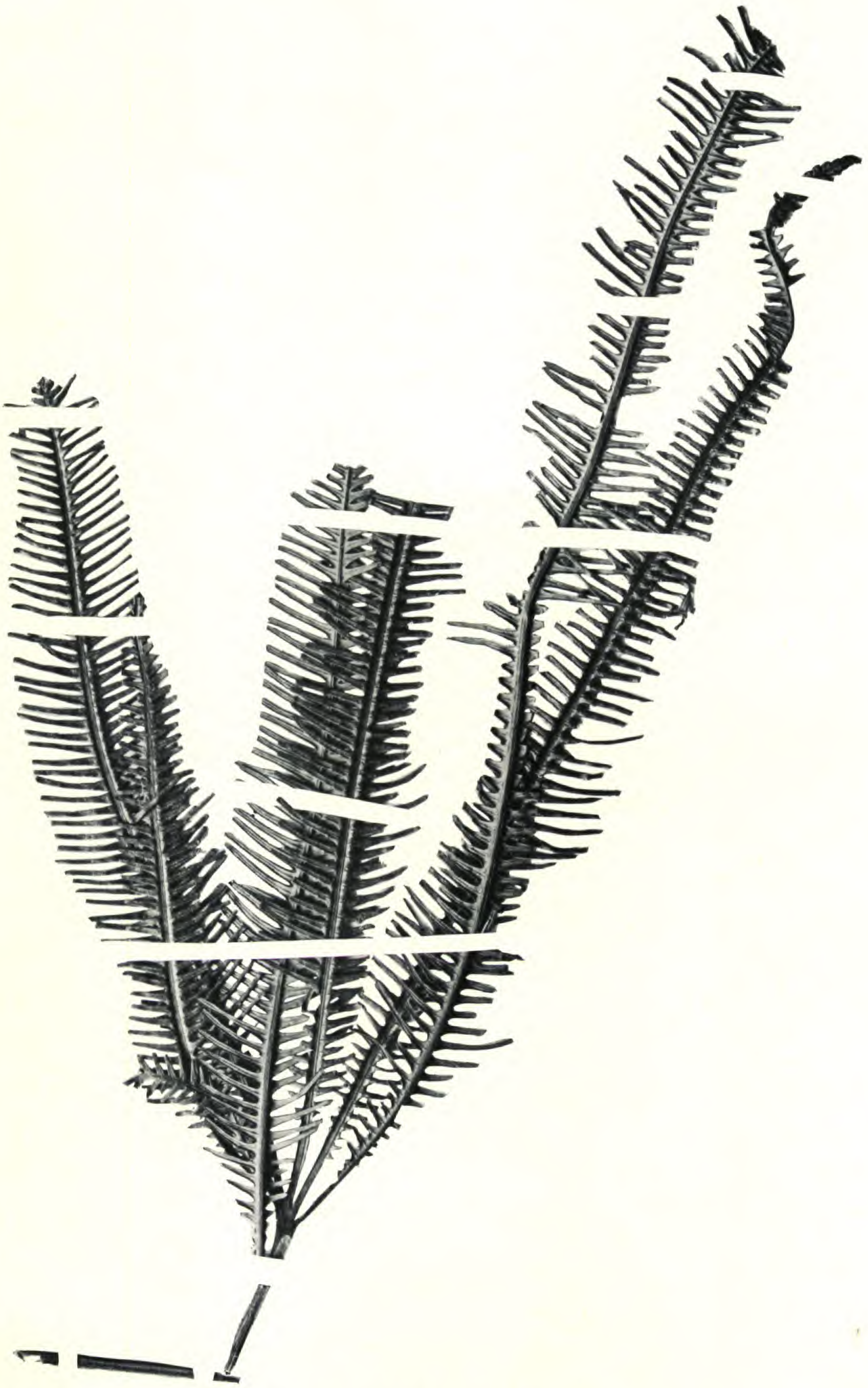

PLATE XVI. MATONIA FOXWORTHYI COPEL.

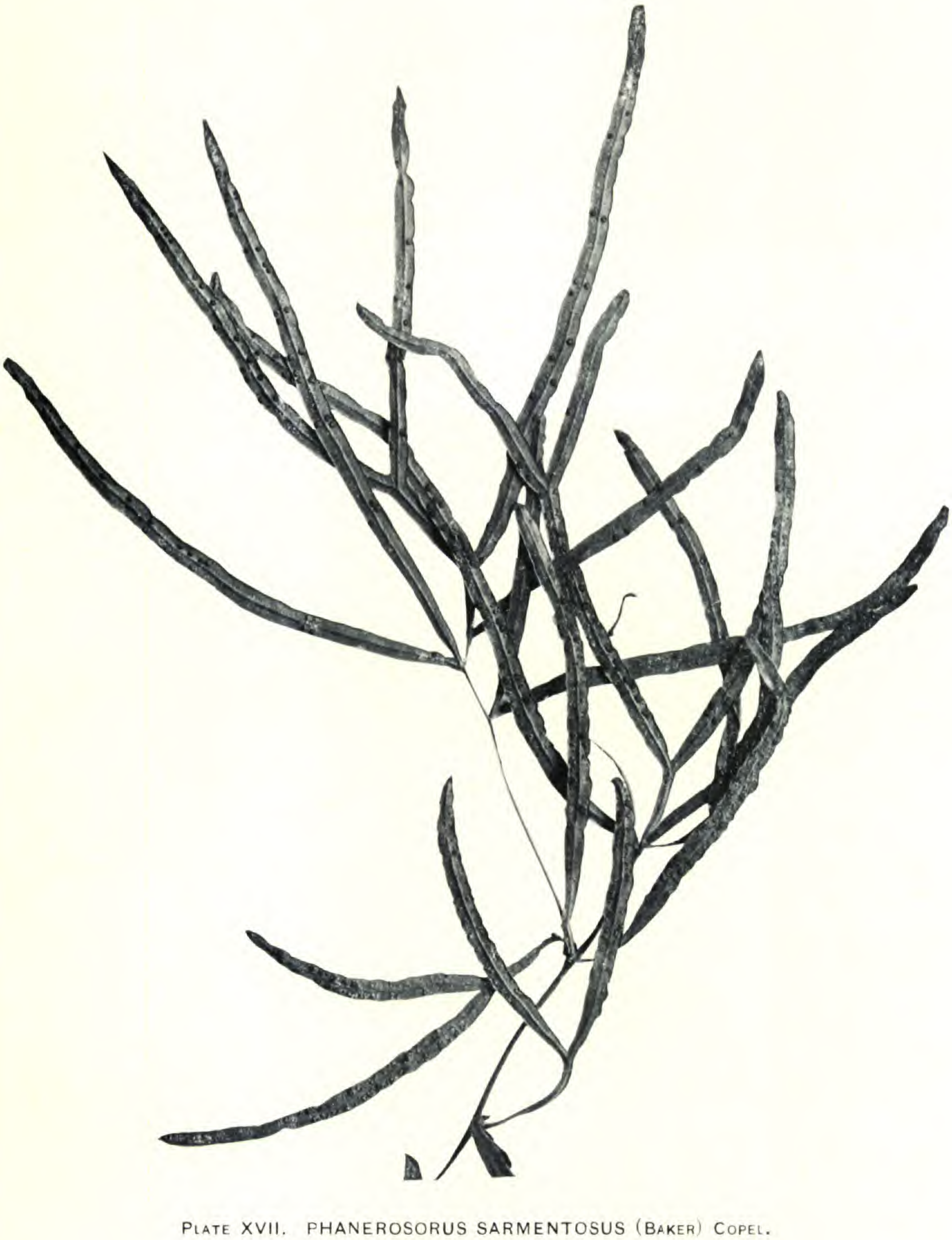

PLATE XVII. PHANEROSORUS SARMENTOSUS (BAKER) COPEL.

PLATE XVIII. CYATHEA ATRUPURPUREA COPEL.

PLATE XIX. BALANTIUM COPELANDI CHRIST.

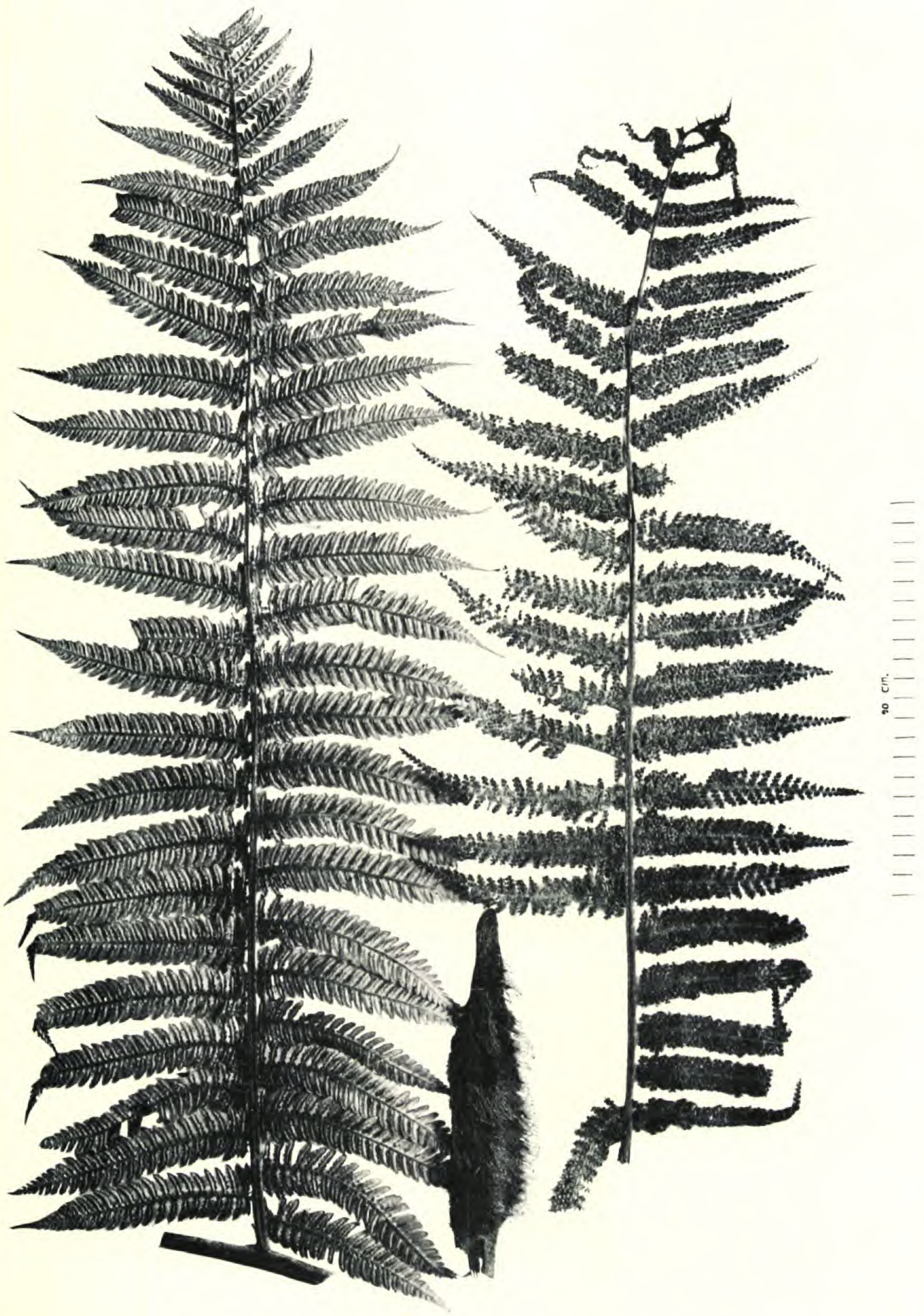

PLATE XX. DICKSONIA BLUMEI (KZE.) MOORE.

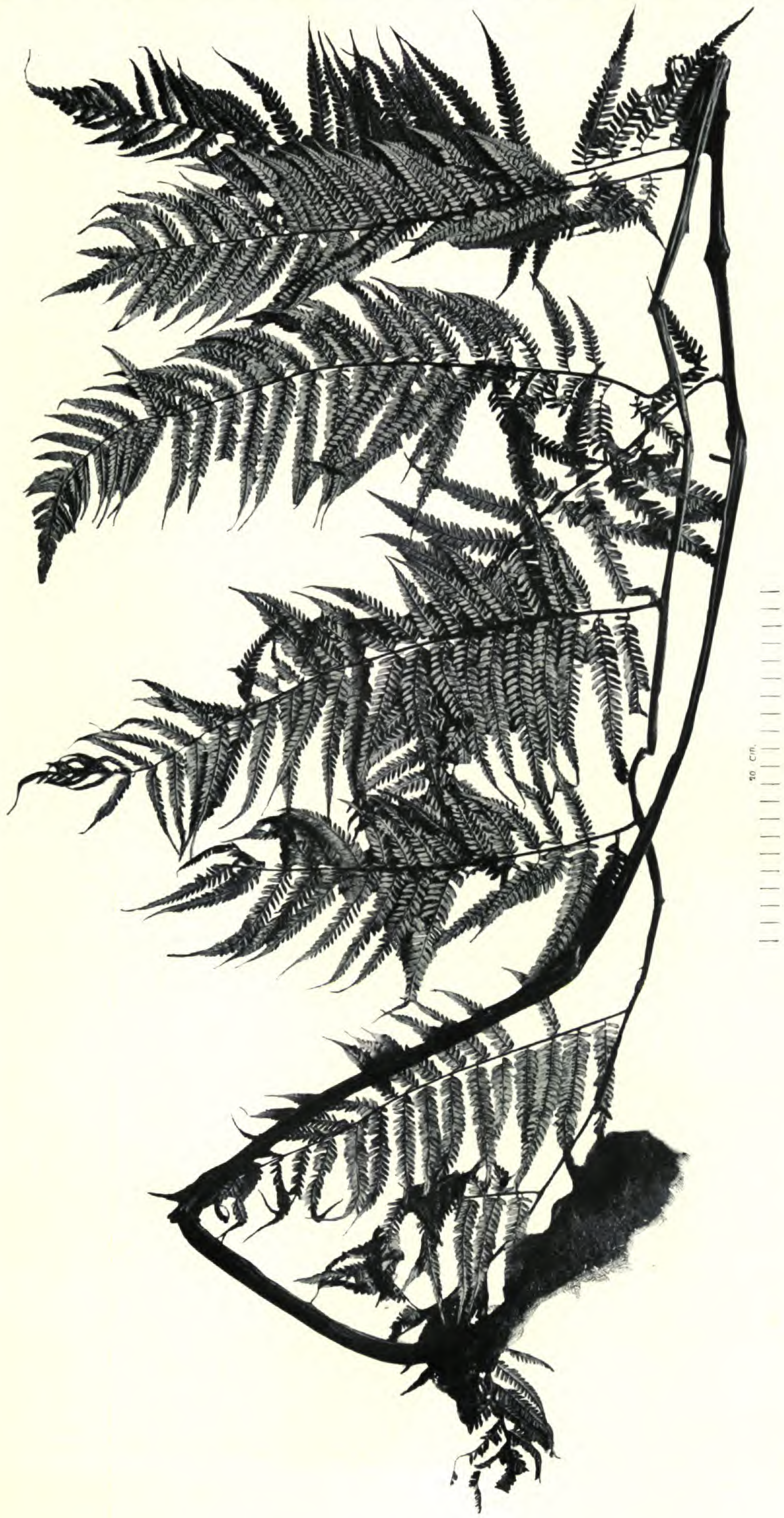

PLATE XXI. CIBOTIUM CUMINGII KZE.

ON HALOPHILA OVATA GAUDICHAUD, A NEGLECTED SPECIES.

By C. H. Ostenfeld.

(*Copenhagen, Denmark.*)

In 1906, while studying the genus *Halophila* and other marine phanerogams in the Kew Herbarium, I observed a specimen from the Philippine Islands which was labeled "*Halophila ovalis* Herb. Philippinense, 1595, Luzon (5–'92) leg. A. Loher." Although it seemed to be closely allied to *Halophila ovalis* (R. Br.) Hook. f., I felt sure that it was a distinct species and noted on the label "nov. sp.," but published nothing regarding it. My note was later seen by Mr. Merrill, while he was working at Kew in 1907, and on his return to Manila, he sent me a *Halophila* collected by himself in Manila Bay in April, 1905, with flowers and fruits, which he supposed to be the same as Loher's plant. This specimen is undoubtedly the same species as that collected by Mr. Loher, and is distinct from *Halophila ovalis* (R. Br.) Hook. f. At first I considered it undescribed, but on closer examination of the material and literature at my disposal and my notes on the species of the genus made in various European herbaria, I found that it is the species described by Gaudichaud in Freycinet's "Voyage autour du monde" as *Halophila ovata,* the type of which was collected in the Marianne Islands, and now in the herbarium of the Muséum d' Histoire Naturelle in Paris. Some years ago I examined Gaudichaud's plant, and noted that it differed considerably from *H. ovalis,* with which it has been identified by all later botanists working on the genus. Gaudichaud himself quotes *Caulinia ovalis* R. Br., as a synonym of his *H. ovata,* and was undoubtedly of the opinion that the two were identical. It seems to have been a mere chance that he altered the name *"ovalis"* to *"ovata"* when transferring the species from *Caulinia* to *Halophila.* I think, however, that it is correct to maintain Gaudichaud's name, and accordingly for the two species we have *Halophila ovalis* (R. Br.) Hook. f., and *H. ovata* Gaudichaud (not of later authors).

Halophila ovalis is a species of wide distribution in the Indian and Pacific oceans, while *H. ovata* is at present known from but two regions—the Mariannes and the Philippines. Gaudichaud's description is wrong in many points with regard to the more minute characters of the flowers,

and to the morphology of the plant, but apart from these errors, which are but natural in such early botanical work, there is no doubt as to the identity of the Philippine plant with Gaudichaud's type; moreover Gaudichaud's figure is excellent. Below is given a diagnosis of the species, as far as the material allows, the male flowers being unknown to me.

Halophila ovata Gaudichaud in Freycinet's Voy. Bot. (1826) 430, *pl. 40, f. 1.*, non *H. ovata* auctt., nec *H. ovalis* (R. Br.) Hook. f. *a ovata* J. B. Balfour in Trans. Bot. Soc. Edinburgh **13** (1878) 335.

Gracilis; caulis horizontaliter repens; internodia gracilia, 1–3 cm longa; rami erecti nulli; nodi foliis duobus, squamis duabus radiceque una instructi; foliorum lamina late ovato-elliptica, obtusa, circiter 9–10 mm longa et 4–5 mm lata, glabra, integerrima, trinervia; nervi secundarii 3–7 inter nervum medium et nervos submarginales suspensi; foliorum petioli laminis equilongi vel paullo longiores. Flores dioeci (?), solitarii, spatha diphylla membranacea suffulti; masculus (sec. Gaudichaud) pedunculatus; stamina 3, unilocularia (?); femineus sessilis, perianthium minimum, triphyllum; ovarium ovoideum, longe rostratum, circiter 2 mm longum; styli 3, filiformes, circiter 6 mm longi; fructus maturus membranaceus, globosus, 2–2.5 mm diametro; semina subglobosa, pallida, 0.5 mm.

Species *H. ovali* affinis, praecipue differt omnibus partibus multo minor graciliorque, nervis secundariis 3–7, nec pluribus (in *H. ovali* 12–25), staminibus unilocularibus (?).

Besides its small size, the above species is most easily distinguished by the arrangement of the secondary nerves. In *H. ovalis* the number varies from 12 to 25, being most often 17 or 18, forming a very acute angle with the median nerve, and the area limited by two secondary nerves is much longer than broad. In *H. ovata* the number of secondary nerves varies from 3 to 7, the most common numbers being from 4 to 6, and they form nearly a right angle with the median nerve, while the area between two secondary nerves is nearly as long as broad, that is, rhomboidal.

In Gaudichaud's figure the leaves are drawn with emarginate tips, but this is incorrect, as I have found upon examination of the type material. In other respects his figure gives an excellent idea of the habit of the plant. In habit it is quite different from *H. ovalis*, and much more like *H. baillonii* Aschers. and *H. decipiens* Ostf., but nevertheless the other characters point to *H. ovalis* as the most closely allied species. As mentioned above, I have not found any male flowers in the material at hand, and it would be very interesting to have them, as Gaudichaud's description of them seems to be incorrect in some important points.

H. ovata Gaudich., has been found only in the following places: Marianne Islands, *Gaudichaud*, specimens in Mus. Hist. Nat. Paris; and the Philippines, Luzon, *Loher 1595*, May, 1892, in Herb. Kew.; Manila Bay, *Merrill 4112*, April, 1905. According to Mr. Merrill the species is very abundant in shallow water along the shore near Manila in April and May, but disappears later in the season.

PHILIPPINE CHLORANTHACEÆ.

By C. B. Robinson.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

The main purpose of this article is to call attention to the presence in the Philippines of the genus *Ascarina,* though still known here from only one collection. It has hitherto been reported from New Caledonia, Polynesia, and New Zealand, but from none of the regions the flora of which is closely allied to that of the Philippines. The one remaining genus of the family is exclusively American.

KEY TO THE PHILIPPINE GENERA OF CHLORANTHACEÆ.

Undershrubs with hermaphrodite flowers..... 1. *Chloranthus*
Small tree with dioecious flowers..... 2. *Ascarina*

1. CHLORANTHUS Sw.

KEY TO THE PHILIPPINE SPECIES OF CHLORANTHUS.

Stamens 3, fruit white, leaf-serrations short..... 1. *C. officinalis*
Stamen 1, fruit red, leaf-serrations long..... 2. *C. brachystachys*

1. **Chloranthus officinalis** Blume Enum. Pl. Jav. (1827) 79.
C. salicifolius Presl Epim. Bot. (1851) 231.
C. inconspicuus Blanco Fl. Filip. ed. 2 (1845) 54; non Sw. in Phil. Trans. **78** (1787) 359.

Luzon, Province of Pampanga, Mount Abu, *Bur. Sci. 1995 Foxworthy:* Province of Bataan, Mount Mariveles, Lamao River, *Williams 413, Elmer 6885, Leiberg 6129, 6136, For. Bur. 1769 Borden;* Limay, *Bur. Sci. 6185 Robinson:* Province of Laguna, Calauan, *Cuming 524:* Province of Tayabas, Mount Banajao, *Whitford 972:* Province of Albay, Mount Mayon, *Bur. Sci. 6470 Robinson.* Mindoro, Baco, *Merrill 1241, 4036;* Mount Halcon, *Merrill 5574;* Baños, *For. Bur. 6207 Merritt.* Mindanao, Lake Lanao, Camp Keithley, *Mrs. Clemens 68, 197:* District of Zamboanga, Sax River, *Williams 2194, 2414.* Basilan, *Hallier s. n.*

2. **Chloranthus brachystachys** Blume Fl. Jav. Chloranth. (1828) *13, pl. 2.*
Luzon, Province of Ilocos Sur, *For. Bur. 5645 Klemme:* Province of Benguet, Pauai, *Bur. Sci. 4374, 4384 Mearns;* Pauai to Baguio, *Merrill 4785;* Baguio, *Elmer 5853, Williams 1362;* Mount Tonglon, *Bur. Sci. 5422 Ramos, For. Bur. 5004 Curran;* without further locality, *Bur. Sci. 2800, 2809, 3491 Mearns:* Province of Nueva Ecija, *Cuming 1392:* Province of Pampanga, Mount Arayat, *Merrill 3828:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 2514,*

3254, Whitford 103, Williams 440, 717, Elmer 6640, For. Bur. 1214 Borden, For. Bur. 2215 Meyer, Leiberg 6050, Merrill Dec. Philip. For. Fl. 188 Borden. MINDORO, Mount Halcon, *Merrill 5644, For. Bur. 4380, 4416 Merritt;* Mount Poloug, *For. Bur. 9963 Merritt;* without further locality, *For. Bur. 12122 Merritt.* NEGROS, Mount Silay, *Whitford 1553.* MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4551, 4682 Mearns & Hutchinson;* District of Davao, Mount Apo, *Copeland 1064, s. n.:* Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.* BASILAN, Santa Isabela to Tipu, *For. Bur. 3996 Hutchinson.*

It is extremely doubtful if the specific names here used are really the oldest, although generally accepted, but the earlier names are at least in some cases of doubtful identity and it is not possible here to form any opinion upon them. There might also be difficulty over the generic name. *Chloranthus,* as such, dates from 1787. *Nigrina* of Thunberg is at least in part cogeneric with it, but considerable doubt exists regarding his original species, the only one published before 1787. There is an older genus *Nigrina* of Linnaeus, published in 1767, but usually reduced to *Melasma* of Bergius, published in the same year, and the name would therefore be available under the Vienna code, though not under the American, for use instead of *Chloranthus,* if Thunberg's genus is really identical with the latter.

2. ASCARINA Forst.

Ascarina philippinensis sp. nov.

Inflorescentiæ spicatæ in paniculis fasciculatis dispositæ, bracteatæ, foliis multo breviores; floribus femineis in rhachide admodum immersis, ovario sessili subgloboso uniloculari, semen unicum pendulum continente; foliis oppositis, basi acutis decurrentibusque apice breviter acuminatis, margine basi excepta serratis, petiolis caulem vaginantibus, caule nodoso.

Flowers sessile, borne in fascicled panicles, bracts at the nodes of the inflorescence unequal, the uppermost usually much the longest, even foliaceous; female flowers alone found, with no true perianth, but encircled at the base by a shallow enlargement of the rachis, ovary sessile, globose, 2.5 mm in diameter, stigma subterminal, sessile, surrounded by a flattened triangular expansion, 0.6 mm wide; ovary 1-celled, with one subterminal pendulous ovule.

A small tree 6 m high, with a nodose stem 12 cm in diameter, the young branches terete or somewhat quadrangular, their bark gray or reddish, striate; leaves papyraceous, elliptic or oblong, 6.5–9 cm long, 3–3.8 cm wide, borne on stipulate petioles 4–9 mm long, which are connate at the base and sheath the stem, acute and somewhat decurrent at the base, at the apex somewhat abruptly contracted into a rounded or retuse mucronate acumen, the margins more or less revolute, glandular-serrate except along the basal fourth, dull-bluish-green on the upper surface, beneath densely brown-lepidote.

Type collected at an elevation of 1950 m on Mount Apo, District of Davao, Mindanao, by R. S. Williams, *no. 2541,* March 31, 1905. N. v., (Bogobo) *maidong.*

Through the courtesy of Lieut.-Col. D. Prain, director of the Royal Botanic Gardens, Kew, a portion of this collection was compared with the material there, and confirmed as "a species of *Ascarina* quite distinct from any at Kew, but nearest to *A. polystachya* Forst., differing by the much shorter spikes and less tapering base of the leaf."

PHILIPPINE PHYLLANTHINÆ.

By C. B. Robinson.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

There are herein enumerated as Philippine some 55 species, belonging to 7 genera, as compared with 35 species in 4 genera credited to the Archipelago by Fernandez-Villar. The increase in genera is due to the separation from *Phyllanthus* of *Glochidion* and *Cicca;* the former now so generally recognized as distinct that it is not here discussed, the reasons for segregating the latter are explained at length under that genus; *Securinega,* with the limits now accepted, is a real addition. The disposition of the species is quite different from that of Villar.

It has been possible to identify nearly all of the material in this herbarium, leaving probably three species of *Glochidion* and two of *Phyllanthus* represented by insufficiently complete specimens to justify description. Cuming's collections are represented here, at least by fragments, but those of Vidal and Loher are wanting, except in a few unimportant instances.

The recorded distribution in related regions of the species of this section of the *Euphorbiaceæ* is as follows.

	India, Ceylon, and Malay Peninsula.[a]	Malay Peninsula, Archipelago and New Guinea.[b]	China, with Formosa.[c]	Japan, with Formosa.[d]	Philippine Islands.
Agyneia	1	1	1	----------	----------
Breynia	6	12	3	4	3
Fluggea	2	2	2	1	2
Glochidion	59	62	12	6	27
Phyllanthus including *Cicca*	56	31	11	8	20
Sauropus	15	7	2	----------	2
Securinega	----------	----------	2	1	1
Total	139	115	33	20	55

[a] Hook. f. Fl. Br. Ind. **5** (1887) 285–336.
[b] Boerl. Handl. Fl. Ned. Ind. **3** (1900) 272–277.
[c] Forbes & Hemsley in Jour. Linn. Soc. Bot. **26** (1894) 420–428 & Suppl.
[d] Hayata in Jour. Coll. Sci. Tokyo **20**[3] (1904) 3–24.

Considering the extent of the two first of these areas it becomes evident that the Philippines have a rich representation of the species of this group. The most recent collections have so added to our list of species, that it is probable that it may still have to be considerably enlarged.

A nomenclatural difficulty has arisen through the publication since the beginning of 1908 of several Philippine species without an accompanying Latin diagnosis. To avoid misunderstanding, it may be said that they are here accepted as published, though to add certainty, such a diagnosis has been added where the species has been accepted as valid, and that when the limits here assigned to such species differ from those of the original author, that his type is in all cases to be considered as that of the species.

KEY TO THE PHILIPPINE GENERA OF PHYLLANTHINÆ.

Calyx greatly thickened at base by union with disk..... 1. *Sauropus*
Calyx not so thickened.
  Rudiment of ovary present in male flower.
    Fruit a capsule, seed-coat not hollow on back..... 2. *Securinega*
    Fruit a berry, seed-coat hollow on back..... 3. *Fluggea*
  Rudiment of ovary not present in male flower, or in a few species of *Phyllanthus* very minute.
    Disk present.
      Fruit a capsule, rarely a berry..... 4. *Phyllanthus*
      Fruit a drupe ..... 5. *Cicca*
    Disk entirely wanting.
      Fruit a capsule..... 6. *Glochidion*
      Fruit a berry ..... 7. *Breynia*

1. **SAUROPUS** Blume.

Styles terminal ..... 1. *S. androgynus*
Styles from the margin of the ovary..... 2. *S. scandens*

1. **Sauropus androgynus** Merr. in For. Bur. Bull. (Philip.) 1 (1903) 30.
Cluytia androgyna Linn. Mant. (1767) 128.
S. albicans Blume Bijdr. (1825) 596.
S. macranthus F.-Villar Noviss. App. (1883) 187, non Hassk. Retzia 1 (1855) 165.

LUZON, Province of Camarines, Pasacao, *Ahern 288*. MINDORO, Puerto Galera, *Merrill 3329*.

The former collection seems clearly of this species, the latter is identical vegetatively, but the calyx of the male flowers varies in length from 1 to 8 mm, presumably with age, and the lobes are not emarginate. This genus being usually divided by the size of the calyx, the second specimen would appear distinct, but it is thought best not to separate it, at least until more complete material can be secured.

India, China, and Java.

2. **Sauropus scandens** sp. nov.
Andrachne sp. (?) Merr. in Philip. Jour. Sci. 1 (1906) Suppl. 74.

Scandens: floribus monoicis, solitariis vel subsolitariis, pedicellatis: perianthio masculino subrotato, breviter 6-lobato, 2.5–3 mm diametro,

glandulis conspicuis vel perianthio coalitis, filamentis connatis, antheris 3, horizontalibus; perianthio femineo 6-partito, 4–5 mm longo, ovario valde depresso, apice truncato, stylis 3, marginalibus, cito bilobatis: ramulis levissime angulatis; foliis breviter petiolatis, lanceolatis, oblongo-lanceolatis vel ellipticis, apice brevissime acuminatis.

Flowers axillary, solitary or perhaps sometimes paired, scattered along the branchlets, those of both sexes borne on pedicels 8–10 mm long and slightly dilated upward: male perianth subrotate, 2.5–3 mm long, the margin forming lobes for a depth of about 0.5 mm only, the lobes broad, rounded, truncate, or usually somewhat retuse; disk-glands 6, opposite the perianth-lobes, oblong-orbicular, about 1 mm in diameter, very conspicuous or more or less coalesced with the perianth; filaments united, 0.3 mm long, anthers 3, horizontal, extrorse, 0.5 mm long: female perianth cut almost to the extreme base into 6 oblanceolate segments, 4–5 mm long, rounded at the apex, contracted at the base; no glands seen; ovary very shortly stalked, 1 mm in diameter, in cross-section rounded-triangular, strongly depressed, the apex truncate and disk-like, styles 3, projecting from the margins of the ovary, at once divided into 2 fleshy lobes, the latter widely spreading and more or less outwardly recurved, about 0.7 mm long, the apices entire or rarely slightly 3-lobed: fruiting perianth hardly increased, fruit succulent, red, about 1 cm in diameter.

Described by the collector as a vine, and appearing to be so: branches and branchlets yellowish, the latter slender and slightly angled: leaves borne on petioles about 2 mm long, the lamina membranaceous, lanceolate, oblong-lanceolate, or elliptic, 2–3.5 cm long, 1–1.7 cm wide, the base rounded or acute, the apex forming a very short acumen, which is obtuse or sometimes mucronate, described as very dark in color, apparently glaucous on the under surface; stipules persistent, lanceolate, about 1 mm long.

LUZON, Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 1934 Borden*, growing as a vine upon *Pithecolobium scutiferum* (Blanco) Benth., at an elevation of 300 m, and apparently rare.

Very similar in many ways to *S. brevipes* Muell-Arg., but that species has racemed flowers. Apparently very distinct in its habit.

2. **SECURINEGA** Commerson.

1. **Securinega acuminatissima** comb. nov.

Phyllanthus acuminatissimus C. B. Robinson in Philip. Jour. Sci. **3** (1908) Bot. 200.

LUZON, Province of Tayabas, Atimonan, *Whitford 676:* Province of Camarines, Ragay, *For. Bur. 10788 Curran;* Pasacao, *Ahern 280.* CEBU, Toledo, *Bur. Sci. 1739 McGregor.* MINDANAO, Province of Surigao, Surigao, *Ahern 351;* Gibon River, north of Las Navas, *For. Bur. 7569 Hutchinson:* Rio Grande Valley, Sabacon, *For. Bur. 6544 Hutchinson:* District of Davao, Santa Cruz, *Williams 2706, 2807.*

This species is not a *Phyllanthus*, as shown by the original description of the

male flowers, which is therein correct, with the addition of the fact that the rudiment of the ovary is sometimes 3-parted. It is less certain that it is not a *Fluggea*, as the fruit is not truly capsular, but slightly fleshy, and it is doubtful whether or not it is dehiscent. The embryo is straight, the testa is not lacunose and much thinner than in *Fluggea virosa*, and the disk of the female flower is not lobed. The style-arms are recumbent upon the ovary, spreading or somewhat ascending.

In some parts of Mindanao, this species is of economic importance, being according to Hutchinson, the species in most common use for posts.

N. v. *Anislag*, Vis., Manobo, Surigao; *Tras*, Moro, Rio Grande.

3. **FLUGGEA** Willd.

Branchlets terete, leaves distinctly acuminate..... 1. *F. flexuosa*
Branchlets 4-angled, leaves not or very shortly acuminate..... 2. *F. virosa*

1. **Fluggea flexuosa** Muell.-Arg. in Linnaea 34 (1865) 76.
Securinega flexuosa Muell.-Arg. in DC. Prodr. 15 ² (1866) 450.

Bohol (probably), *Cuming 1855*. If this is the correct locality, it lessens the surprise that we have no further collections of this species, as this island is as yet little explored botanically. The solitary leaf, which represents Cuming's type in this herbarium, is often perfectly matched by leaves of other species, especially *Glochidion rubrum*.

Endemic.

2. **Fluggea virosa** Baill. Étud. Gen. Euph. (1858) 593.
Phyllanthus virosus Roxb. ex Willd. Sp. Pl. 4 (1805) 578.
Xylophylla obovata Willd. Enum. Pl. Hort. Berol. (1809) 329.
Fluggea obovata (Ham. in) Wall. ex F.-Vill. Noviss. App. (1883) 189.
Fluggea microcarpa Blume Bijdr. (1825) 580.
Securinega microcarpa Muell.-Arg. in DC. Prodr. 15 ² (1866) 434.
Securinega obovata Muell.-Arg. in DC. Prodr. 15 ² (1866) 449.
Cicca pentandra Blanco Fl. Filip. (1837) 701.
Fluggea leucopyrus F.-Vill. Noviss. App. (1883) 189, non Willd. Sp. Pl. 4 (1805) 757.
Securinega ovata Vidal Cat. Pl. Prov. Manila (1880) 44, nomen.

Babuyanes Islands, Camiguin Island, *Bur. Sci. 4011 Fénix*. Luzon, Province of Ilocos Norte, Cape Bojeador, *For. Bur. 13826 Merritt & Darling;* Bangui, *For. Bur. 13882, 13896 Merritt & Darling:* Province of Ilocos Sur, *Cuming 1169;* Santiago, *For. Bur. 14067, 15658 Merritt & Darling:* Province of Benguet, Sugpon, *For. Bur. 14120, 14117 Merritt & Darling;* Twin Peaks, *Elmer 6404;* Baguio, *For. Bur. 10817 Curran:* Province of Nueva Vizcaya, Bambang, *For. Bur. 15815, 15821 Curran & Merritt:* Province of Pampanga, Mount Arayat, *Bolster 52:* Province of Bulacan, Norzagaray, *For. Bur. 7205, 7210 Curran:* Province of Bataan, Mount Mariveles, Lamao River, *Whitford 390, 534, s. n., For. Bur. 775 Borden, Leiberg 6025;* Moron, *Bur. Sci. 949 Mangubat:* Province of Rizal, San Mateo, *For. Bur. 1123 Ahern's collector;* Bosoboso, *Merrill 2648;* Antipolo, *Merrill 1714;* Malapadnabato, *Merrill 2732, 2743;* Tanay, *Bur. Sci. 3341 Ramos:* Province of Laguna, Los Baños, *Elmer s. n.:* Province of Tayabas, Gumaca, *Whitford 863:* Province of Camarines, Maagnas, *Bur. Sci. 6319 Robinson.* Masbate, *Merrill 3056.* Mindanao, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*

This species is referred to in the Pflanzenfamilien as *F. obovata* (L.) Wall. Repeated search has not enabled me to find any Linnaean species referable here, and the citation is probably a mere slip. The combination *Fluggea obovata* was

first made by Hamilton in Wallich's catalogue, but does not seem to have been published till 1883. Failure to find any older name has compelled the use of Willdenow's *Phyllanthus virosus*, although it was he who also originated the other specific name as *Xylophylla obovata*.

Cicca pentandra Blanco has been reduced here by Mueller, Merrill, and Villar, and there can be no doubt that they were correct, although the description is not exact in some details. It will be noted that this species has been recently collected at what is practically Blanco's type locality. The reduction of *F. leucopyrus* F.-Villar is pure guesswork, based on the fact that it has not appeared in any recent collection.

Securinega ovata Muell. is merely listed by Vidal; there is no such species, but he elsewhere cites *S. obovata* as a synonym of *F. obovata*, which is correct, and it is probable that the earlier name is only a misprint.

N. v. *Botolan*, Tag., *Baiset*, Tag., Bataan: *Granatang gubat*, Tag., Rizal; *Tulitangalung*, Masbate.

India, China, Malaysia, Australia, and Tropical Africa.

4. PHYLLANTHUS Linn.

Styles simple or very slightly 2-lobed.
- Stamens 3, dehiscing vertically ..... 1. *P. cordatulus*
- Stamens 2, dehiscing horizontally.
  - Leaves 3 mm or more in width ..... 2. *P. lamprophyllus*
  - Leaves not exceeding 2 mm in width ..... 3. *P. curranii*

Styles 2-lobed or 2-parted.
- Stamens 5, fruit fleshy ..... 4. *P. reticulatus*
- Stamens 4–2.

Male calyx 6-parted.
- Anthers dehiscing vertically.
  - Capsules smooth.
    - Testa with anastomosing ridges ..... 5. *P. benguetensis*
    - Testa nearly smooth ..... 6. *P. tenuipes*
  - Capsules muricate, testa with free ridges ..... 7. *P. urinaria*
- Anthers dehiscing horizontally.
  - Filaments free or nearly so.
    - Branchlets not winged.
      - Stipules hastate ..... 8. *P. samarensis*
      - Stipules not hastate ..... 9. *P. dumosus*
    - Branchlets narrowly winged.
      - Leaves 6–9 mm wide ..... 10. *P. everettii*
      - Leaves 2–5 mm wide ..... 11. *P. simplex*
  - Filaments united ..... 12. *P. niruri*

Male calyx 4-parted; ovary 3-celled.
- Perianth-segments with entire margins.
  - Leaves strongly 3-nerved ..... 13. *P. triphlebius*
  - Leaves pinnately veined only ..... 14. *P. stipularis*
- Perianth-segments lacerate-dentate ..... 15. *P. mindorensis*
- Perianth-segments fimbriate.
  - Perianth-segments linear-lanceolate ..... 16. *P. blancoanus*
  - Perianth-segments ovate.
    - Leaves broadest near base ..... 17. *P. laciniatus*
    - Leaves broadest beyond middle ..... 18. *P. leytensis*

Stigmas sessile; ovary more than 3-celled ..... 19. *P. buxifolius*

1. **Phyllanthus cordatulus** sp. nov. § *Gomphidium.*

Arbuscula monoica: floribus fasciculatis, mediocriter pedicellatis, masculini perianthii segmentis 6, biseriatis, exterioribus paullo longioribus angustioribusque, disci glandulis 6, liberis, patelliformibus; perianthio femineo 6-partito, biseriato, segmentis interioribus longioribus latioribusque, disco plano, ovario pedicellato, 3-lobato, 3-loculari, stylis 3, usque ad medium coalitis, supra patentibus, non lobatis: foliis subcoriaceis, ellipticis vel ovalibus, basi cordatulis, inaequilateralibus, breviter petiolatis; stipulis parvis, lanceolatis.

Flowers monoecious; the male and female on pedicels of about the same length, 6–11 mm, usually 3 in a fascicle: male flowers with the 6 perianth-segments in two rows, lanceolate to ovate, 1.2–1.5 mm long, 0.5–0.8 mm wide, the 3 of the outer row slightly longer and narrower than those of the inner; disk-glands 6, patelliform, separate, 0.3–0.4 mm in diameter; filaments 3, free, 0.2–0.3 mm long, comparatively stout; anthers slightly longer than the filaments, dehiscing vertically: female flowers also with a biseriate perianth, the outer 3 sepals 2.7 mm long, 1.6–1.7 mm wide, the inner 3 slightly exceeding 3 mm in length and usually 2 mm in width, somewhat foliose; disk flattened, occupying the base of the calyx; ovary short-stalked, at anthesis 0.7 mm in diameter, 3-grooved, 3-celled; styles 3, united for 1.3 mm, and then for about the same distance spreading and at the apices reflexed, entire or very obscurely 2-lobed: capsules depressed-globose, 3.5 mm in diameter, at least when dry brownish, 3-grooved, with an intermediate line, 3-celled; the seeds (immature) oval, 1.5 mm long, the testa inconspicuously minutely punctate.

A bush 1 m high, its stems purplish-brown, lenticellate, glabrous in all its parts: leaves borne on petioles not exceeding 1 mm in length, alternate, subcoriaceous, the lamina elliptic or oval, 15–24 mm long, 9–13 mm wide, or some leaves smaller, the margins entire, revolute, the base inequilateral, shallowly cordate or obtuse on at least one side, the apex rounded, often slightly mucronate or emarginate; lateral veins on each side of the midrib 4–8, arched-anastomosing, secondary reticulations few near the midvein but conspicuous near the margin; stipules lanceolate, 1 mm long.

LUZON, Province of Zambales, *Bur. Sci. 5106 Ramos,* with flowers and fruit, December 14, 1907.

2. **Phyllanthus lamprophyllus** Muell.-Arg. in DC. Prodr. 15 [2] (1866) 324.

PALAWAN, Iwahig River, *For. Bur. 4156 Curran.*

The Philippine specimen referred here agrees in almost every respect with the original description, except that the leaves are slightly longer but proportionally of equal width, sharply acuminate at the apex. Flowers of both sexes are present, and certainly place the specimen in the section *Emblicastrum.*

Previously reported by F.-Villar from the Philippines, otherwise only known from Java.

3. **Phyllanthus curranii** sp. nov. § *Emblicastrum.*

Floribus solitariis, breviter pedicellatis; perianthii masculini segmentis 4, exterioribus majoribus, disci glandulis liberis, minutis; filamentis coalitis, antheris 2, transverse dehiscentibus: perianthii feminei segmentis 4 vel 5, disco angusto, annulari, ovario globoso, stylis 3 integris, apice liberis: foliis subsessilibus, lineari-rhomboideis, parvis; stipulis linearilanceolatis, acutis, deciduis.

Flowers glabrous, solitary, borne on pedicels 0.5–1 mm long, the male with 4 perianth-segments arranged in two rows, the outer 1–1.2 mm long, nearly orbicular, the inner lanceolate; disk glands free, minute, situated at the sinuses of the perianth-segments; staminal column in all 0.5 mm long, the filaments united, anthers 2, dehiscing transversely: perianth-segments of female flowers 4 or 5, oblong-ovate, slightly exceeding 1 mm in length, their apices rounded; disk very narrow, annular with a lobed margin; ovary globose, 0.6 mm in diameter, 3-celled; styles 3, free at the rounded and undivided pale-colored apex, nearly as long as the ovary: capsules 3 mm in diameter, 3-celled, the testa of the young seeds smooth.

A small tree or shrub 3 m high, its grayish stems 3 cm in diameter, the grayish or reddish branches terete or the upper conspicuously angled: leaves subsessile, linear-rhomboid, 3.5–7 mm long, 1–2 mm wide, the base usually inequilateral and at least on one side rounded, the margins revolute, below the thickened apex rounded, the upper surface shining, the under paler; lateral veins slender, 10–12 on each side of the midrib; stipules linear-lanceolate, acutely-acuminate, 1–1.5 mm long, deciduous.

LUZON, Province of Nueva Vizcaya, Santa Fé, *For. Bur. 10889 Curran* (type), *For. Bur. 18027 Merritt:* Province of Pampanga, Mount Arayat, *Loher 4770*, our specimen sterile, but doubtless the same species.

4. **Phyllanthus reticulatus** Poir. Encycl. Méth. **5** (1804) 298.
P. chamissonis Klotzsch in Nov. Act. Nat. Cur. **19** (1843) Suppl. **1**: 420.
Cicca decandra Blanco Fl. Filip. (1837) 701.
P. microcarpus Muell.-Arg. in Linnaea **32** (1863) 51.

BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 3967 Fénix.* LUZON, Province of Ilocos Norte, Bangui, *For. Bur. 13897, 15535 Merritt & Darling:* Province of Ilocos Sur, Santiago, *For. Bur. 15659 Merritt & Darling:* Province of Union, Bauang, *Elmer 5647, 5717:* Province of Benguet, Sugpon, *For. Bur. 14120a Merritt & Darling;* Itogon to Dilopirip, *For. Bur. 15880 Bacani;* Mount Pulog, *For. Bur. 18181 Merritt:* Province of Tarlac, O'Donnell, *For. Bur. 5154 Curran:* Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 2715 Borden, For. Bur. 6348 Curran, Williams 521, Elmer 6702:* Province of Rizal, Manila, *Merrill 372;* near Mariquina, *Bur. Sci. 6524 Robinson:* Province of Laguna, Los Baños, *Hallier s. n.* CEBU, Cebu, *Hallier s. n.* MINDORO, Calapan, *Merrill 905.* MINDANAO, District of Zamboanga, Sax River, *Williams 2354:* Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*

The specimens cited above include representatives of both of the varieties into which the species was divided by Mueller.

N. v. *Bagbagutot,* Il., Camiguin; *Tinatinan,* Tag., Manila; *Tintatintahan, Malatinta,* Tag.

Malaysia, tropical Asia and Africa, reported doubtfully from Australia.

5. **Phyllanthus benguetensis** sp. nov. § *Paraphyllanthus.*

Floribus monoicis, solitariis, glabris, brevissime pedicellatis, perianthii segmentis 6, obtusis, masculinis lanceolatis, femineis oblongis; staminibus 3, filamentis usque ad medium connatis, antheris longitudinaliter dehiscentibus; ovario glabro, 6-sulcato, 3-loculari, stylis 3, basi liberis, supra medium bifurcatis; disco femineo cupulari, masculino 6 glandulas patelliformes efformantibus: foliis distichis, oblongis, ellipticis, vel oblongo-obovatis, basi subæqualibus, apice brevissime acute acuminatis; stipulis lanceolatis, acutissimis.

Flowers solitary or very rarely paired, glabrous, those of both sexes on very short pedicels; perianth-segments of the male flowers 6, slightly exceeding 1 mm in length, lanceolate, obtuse at the apex; disk-glands 6, separate, patelliform, about 0.2 mm in diameter; filaments 3, connate to about the middle, 0.3 mm long, anthers 0.2 mm long, dehiscing vertically: female flowers with a similar perianth, but the segments oblong; disk cupular, the upper margin nearly entire but showing 6 slight rounded elevations alternating with the perianth-segments; ovary 0.6 mm in diameter, 6-lobed; styles 3, free and for 0.2–0.3 mm entire, with a median groove, then forking for a somewhat shorter distance into 2 slender widely spreading lobes: capsules depressed-globose, 2.5 mm in diameter, 3-celled; the seeds 1.2 mm long, the testa yellowish, on the back strongly marked by reticulate ridges, giving somewhat of a honeycomb effect, the markings showing also near the margins on the sides.

A branching undershrub, 30–50 cm high, the stems woody, purplish below, passing into grayish above, terete, lightly striate, glabrous throughout or the youngest parts puberulent; leaves distichous, borne on petioles 0.5 mm long, the lamina membranaceous, oblong, elliptic, or oblong-obovate, 9–13 mm long, 5–8.5 mm wide, the base equilateral or somewhat inequilateral, subcuneate or rounded, the apex rounded and abruptly contracted into a very short but conspicuous acute acumen; lateral veins on each side of the midrib 5–7, or with some of the intervening ones nearly as prominent; stipules 1.5 mm long, lanceolate, at the apex very acute.

Luzon, Province of Benguet, Bàguio, *Williams 966* (type), *1081*, *Elmer 6632* in part; Rio Trinidad, *Bur. Sci. 5520 Ramos.*

Closely related to *P. urinaria* Linn., but distinguished at once by its seeds and capsules, its broader leaves not pubescent on the margins, and its woody stem.

6. **Phyllanthus tenuipes** sp. nov. § *Paraphyllanthus.*

Floribus monoicis, longiter pedicellatis, solitariis, perianthio 6-partito; florum masculinorum glandulis 6, liberis, patelliformibus, staminibus 3, filamentis liberis, antheris longitudinaliter dehiscentibus; florum femineorum glandulis fere liberis, ovario glabro, pedicellato, stylis 3, connatis dein liberis bifurcatis: foliis ovalibus vel ellipticis, basi sæpius angustatis ibique truncatis.

Male flowers borne on very slender pedicels attaining 14 mm in length, solitary; perianth-segments 6, varying in outline from lanceolate to obovate, slightly exceeding 1 mm in length, acuminate at the apex; discal glands 6, patelliform; filaments 3, free, comparatively stout, 0.2 mm long; anthers still shorter, dehiscing vertically or somewhat obliquely: female flowers on slightly stouter pedicels attaining a length of 3 cm; perianth-segments 6, oblanceolate or obovate, 2 mm long, the apex rounded or very shortly acuminate; glands nearly separate, forming an undulating ring, curving inward opposite the perianth-segments and outward alternately with them, about 4 glands to each segment; ovary raised on a short stout pedicel, depressed-globose, 0.4 mm in diameter, glabrous; styles united for about 0.6 mm and then forming 3 lobes, which almost immediately bifurcate, the lobes in all only 0.1 mm long, stellately arranged: capsules depressed-globose, glabrous, 3 mm in diameter; young seeds 1.3 mm long, the testa yellowish, inconspicuously minutely tuberculate.

An undershrub about 30 cm high, branching near the base, and sparingly above, the stems purplish, terete or slightly angled, finely striate, puberulent or glabrescent: leaves distichous, borne on petioles less than 1 mm in length, the lamina chartaceous, elliptic, oblong, oval or rarely ovate, variable in size, the larger 10–15 mm long, 6.5–11 mm wide, rounded or mucronate at the apex, usually contracted near the base and there truncate or very slightly cordate, the margins revolute; lateral veins on each side of the midrib 4–6; upper surface of the lamina olivaceous, under surface glaucous.

LUZON, Province of Benguet, Daklan to Kabayan, *Merrill 4419* (type); Itogon, *Bur. Sci. 5758 Ramos;* Itogon to Dilopirip, *For. Bur. 15879 Bacani.*

In general appearance resembling *P. cordatulus,* but separated at once by the very different styles.

7. Phyllanthus urinaria Linn. Sp. Pl. (1753) 982.

LUZON, Province of Benguet, Baguio, *Elmer 6632 pte.:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3157, Williams 97:* Province of Rizal, San Francisco del Monte, *Loher 4761.* MINDORO, Calapan, *Bur. Sci. 944 Mangubat.* CEBU, Cebu, *Barrow 17.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 7.* BASILAN, Santa Isabela, *DeVore & Hoover 11.*

N.v. *Minuh-minuh,* Moro, Basilan.

Cosmopolitan in the Tropics.

8. Phyllanthus samarensis Muell.-Arg. in Linnaea 34 (1865) 73.

SAMAR, *Jagor s. n.*

This species is still unknown except from the original specimens, which bore neither female flowers nor capsules.

9. Phyllanthus dumosus sp. nov. § *Euphyllanthus.*

Frutex dumosus, floribus axillaribus, solitariis vel subsolitariis, mediocriter pedicellatis, perianthio 6-partito; utriusque sexus disci glandulis liberis; floribus masculinis staminibus 3, filamentis brevibus, liberis; floribus femineis ovario 6-lobato, 3-loculari: foliis parvis, ellipticis, ovatis,

ovalibus, vel subrotundis, apice leviter cordatis, margine revolutis, apice apiculatis; stipulis parvis, lanceolatis, apice acumine deciduo instructis.

Flowers axillary, solitary or rarely in pairs, the male borne on pedicels 5–7 mm long, their perianth-segments 6, somewhat exceeding 1 mm in length, varying in outline in the same flower from lanceolate to oval, obtuse or rounded at the apex; disk-glands 6, free, about 0.2 mm long; stamens 3, the filaments free, about 0.3 mm long, the anthers equally long, their cells oval, dehiscing horizontally: female flowers often on shorter pedicels than the male, but these in fruit attaining 15 mm, perianth-segments 6, oblanceolate to obovate, 1 mm long, their apices acute or somewhat acuminate; disk-glands 6, free, small; ovary glabrous, 6-lobed, 3-celled; styles 3, forked almost to the base, the arms about 0.4 mm long, nearly flat upon the ovary: capsules 3 mm in diameter, 6-grooved, 3-celled, the seeds about 1.7 mm long, the testa densely verrucose-tuberculate along longitudinal lines.

A shrub 1 m high, usually much branched, the branches and terete branchlets covered with gray bark, the latter more or less pubescent especially on the youngest shoots: leaves deciduous when dried, borne on petioles 0.5 mm long, the lamina chartaceous, elliptic, oval, ovate, or nearly orbicular, 2–7 mm long, 1.7–4.5 mm wide, the base equilateral or inequilateral, slightly cordate, the margins revolute, the apex rounded or slightly retuse, apiculate, the upper surface shining; veins on each side of the midrib 4–7; stipules lanceolate, not hastate, with an acute acumen at the apex, but this deciduous, older stipules appearing ovate, those on either side of the petiole often contiguous beneath it.

Luzon, Province of Ilocos Norte, Mount Piao, at 1,100 m elevation, *For. Bur. 13974* (type), *13978 Merritt & Darling.*

10. **Phyllanthus everettii** sp. nov. § *Euphyllanthus.*

Frutex vel arbuscula: floribus masculinis fasciculatis, mediocriter pedicellatis, perianthii segmentis 6, ovatis vel lanceolatis, disci glandulis suborbicularibus, staminibus 3, liberis, antheris transverse dehiscentibus; floribus femineis longius pedicellatis, solitariis; capsulis parvis, 3-locularibus; seminum testa brunnea, minutissimis papillis lineatim dispositis obtecta: ramulis anguste bialatis, intra alas minute sed dense pubescentibus; foliis distichis, lanceolatis vel rarius ellipticis, apice rotundatis; stipulis hastatis, apice acuminatissimis, basi productis.

Monoecious, the female flowers apparently much fewer and opening earlier: male flowers in fascicles usually of 3, borne on slender pedicels 2–12 mm long; perianth-segments 6, white, ovate or lanceolate, 1–1.2 mm long, 0.6–0.7 mm wide, obtuse and sometimes very shortly mucronate at the apex, with a conspicuous mid-vein; disk composed of 6 nearly orbicular minutely papillose free glands 0.4 mm in diameter and alternate with the perianth-segments; filaments 3, free, 0.7–0.8 mm long; anthers less than 0.3 mm long, dehiscing transversely: female flowers solitary, borne on pedicels 12–22 long, perianth as in the male; disk annular, its

upper margin with 6 lobes alternating with the perianth-segments, in all 1.5 mm in diameter; styles 3, 2-forked almost to the base, the arms slender, over 1 mm long: capsule brown, depressed-globose, 3 mm in diameter, 3- or less evidently 6-grooved, 3-celled, with 2 seeds in each cell, testa brown, covered with minute papillæ disposed in longitudinal lines.

A small shrub 3 m high, the branchlets narrowly 2-winged and the smaller ones slightly compressed, between the wings densely but minutely pubescent: leaves alternate, distichous, borne on minutely pubescent petioles less than 1 mm long, the lamina chartaceous, glabrous, lanceolate or elliptic, 2–3.5 cm long, 6–9 mm wide, the margins revolute, the apex obtuse, usually mucronulate, toward the base narrowed, at the extreme base rounded and often slightly inequilateral; primary lateral veins on each side of the midrib 9–11; stipules membranaceous, 2 mm long, hastate and produced below the base of the petiole, the apices very acute.

LUZON, Province of Nueva Viscaya, Cordon, *Merrill 164:* Province of Tayabas, Lucena, *Merrill 2885.* NEGROS, Gimagaan River, *For. Bur. 4301 Everett* (type).

Allied to *P. simplex* Retz. Male flowers of this species greatly resemble those of *P. samarensis* Muell.-Arg., of which a portion of the original collection is in this herbarium, but it seems to be distinguishable not only by its winged stems but also by the wider stipules (1 mm at the fork), which are also more strongly produced downward; the leaves are larger and somewhat different in shape, though similar at the base. It is also close to *P. myrtifolius* Wight, but differs in the same characters as just noted.

N. v. *Miagos,* Vis., Negros.

11. **Phyllanthus simplex** Retz. Obs. Bot. 5 (1789) 29.

LUZON, Province of Pangasinan, *Bur. Sci. 4837 Ramos:* Province of Bulacan, Norzagaray, *Yoder 195:* Province of Rizal, Bosoboso, *Bur. Sci. 1182 Ramos;* Manila, *Merrill 3433, Philip. Normal School 68 Arcebal, Hallier s. n.;* Diliman, *Marave 100.* MINDORO, Puerto Galera, *Merrill 3343.* MINDANAO, District of Davao, Davao, *Copeland 605;* Darong, *Williams 2611 A.*

Manchuria to India and Polynesia.

12. **Phyllanthus niruri** Linn. Sp. Pl. (1753) 981.

P. carolinianus Blanco Fl. Filip. (1837) 691.

P. kirganelia Blanco Fl. Filip. ed. 2 (1845) 480, non Willd. Sp. Pl. 4 (1805) 587.

BATANES ISLANDS, Batan Island, Santo Domingo de Basco, *Bur. Sci. 3722 Fénix.* LUZON, Province of Pampanga, Bacolor, *Parker 18:* Province of Bulacan, Meycauayan, *Marave 48:* Province of Rizal, Bosoboso, *Bur. Sci. 1048 Ramos;* Manila, *Merrill 72, 356, 3479, Philip. Normal School 121 Pineda:* Province of Cavite, Cavite, *Bur. Sci. 153 Foxworthy:* Province of Laguna, Calauan, *Cuming 717:* Province of Tayabas, Atimonan, *Gregory 30.* PANAY, Iloilo, *Copeland s. n.* PALAWAN, Puerto Princesa, *For. Bur. 4178 Curran.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.:* District of Davao, Davao, *Copeland 571;* Santa Cruz, *Williams 2754.*

Blanco's species, the specific name changed in the second edition, has been generally reduced to *P. niruri.* The description does not entirely fit, but is nearer to that of this species than of any other.

N.v. *Sampasampalucan,* Tag., Manila, Rizal: *Iba-iba-an,* Tag., Bulacan.

Cosmopolitan in the Tropics, except of Australia.

13. **Phyllanthus triphlebius** sp. nov. § *Eriococcus.*

Floribus solitariis vel rarius geminatis, brevissime pedicellatis; masculinis perianthio biseriato, 4-partito, disci glandulis minimis, liberis, filamentis 2, connatis, antheris transverse dehiscentibus; femineis perianthio 6-partito, disco cupulari, continuo, ovario glabro, stylis 3, supra medium bifurcatis: foliis distichis, oblique oblongo-lanceolatis, parvis, valde trinerviis; stipulis lanceolatis, apice acutissimis.

Monoecious: the flowers solitary or paired, the male borne on pedicels slightly more than 1 mm long, their perianth-segments 4, 1.5 mm long, obtuse at the apex, the margins entire, the outer lanceolate, the inner linear-oblong; glands 4, minute, separate; staminal column in all 0.5 mm long, the filaments united throughout their length, anthers 2, dehiscing horizontally: female flowers on comparatively thick pedicels 0.5 mm long, their perianth-segments 6, about 1 mm long, obovate, the margins entire, the apex rounded or very shortly acuminate; disk continuous, somewhat 6-lobed; ovary glabrous, hemispherical, 0.3 mm in diameter; styles 3, free almost from the base and entire for about 0.4 mm, then forming two slightly shorter slender lobes with outwardly curved tips: capsules red, glabrous, depressed-globose, 2 mm in diameter, 6-grooved, 3-celled, each cell containing 2 seeds with a yellowish-brown testa marked dorsally by comparatively coarse longitudinal bands.

An undershrub 10–40 cm high, its woody stems branching at the base, in older plants not again till the middle or near the apex, striate, somewhat angled, minutely pubescent or glabrescent: leaves subsessile, the lamina glaucous on the under surface, oblong-lanceolate, 5.5–8 mm long, 1.5–2 mm wide, at the inequilateral base rounded or the lower margin nearly straight, at the apex acute, mucronate; the margins revolute, from the base strongly 3-nerved, lateral veins inconspicuous, 5 or 6; stipules 1.5–2 mm long, lanceolate, their bases truncate or subhastate, their apices very slenderly acute.

Luzon, Province of Nueva Viscaya, Bagabag, *Merrill 170:* Province of Rizal, Bosoboso, *Bur. Sci. 1001 Ramos:* Province of Laguna, Pagsanjan, *Topping 510* (type).

14. **Phyllanthus stipularis** Merr. Philip. Jour. Sci. 1 (1906) Suppl. 75. § *Eriococcus.*

Luzon, Province of Bataan, Mount Mariveles, Lamao River, *Whitford 282, 1102, Williams 608, Copeland s. n., Elmer 6804, For. Bur. 2087 Borden, For. Bur. 2841 Meyer, For. Bur. 6280 Curran.*

15. **Phyllanthus mindorensis** sp. nov. § *Eriococcus.*

Floribus masculinis fasciculatis, mediocriter pedicellatis, perianthii segmentis 4, lanceolatis, lacero-dentatis vel rarius fimbriato-laciniatis; glandulis 4, liberis; filamentis connatis, brevissimis, antheris 2, horizontaliter dehiscentibus: floribus femineis saepius solitariis, longiter pedicellatis; perianthii segmentis 6, lanceolatis vel ovatis, lacero-dentatis; disco

annulari, 6-lobato; ovario sparse pubescente, 3-loculari: foliis brevissime petiolatis, rhomboideo-oblongis, basi inaequilateralibus, acutis.

Male flowers few in a fascicle, borne on pedicels 2–10 mm long; perianth-segments 4, broadly lanceolate, the margins merely lacerate-dentate or somewhat fimbriate; glands 4, slightly shorter than wide, 0.5 mm long, obscurely tuberculate but not near the margin; staminal column very short, bearing on its apical margin 4 horizontally dehiscing anther-cells surrounding a small but definite rudiment of the ovary: female flowers usually solitary, sometimes in the same fascicles with the male, borne on pedicels 2–3 cm long, slender at the base but conspicuously thickened near the flower; perianth-segments 6 or rarely 5, lanceolate-ovate, 2–3 mm long including the long slender acumen, lacerate-dentate; disk shallowly annular, its upper margin forming as many oblong lobes as the perianth has segments, the lobes usually notched and glandular at the apex; ovary with scattered hairs, subglobose, 2 mm in diameter (flower rather old), styles 3, bifid, with short slender lobes, at the base more or less united: capsules subglobose, 4 mm in diameter, glabrous; no mature seeds found.

A woody bush 1 m high, its numerous branches crowded near the apex, the older parts of the stem covered with gray bark, the branches more or less densely pubescent: leaves distichous, borne on petioles less than 0.5 mm long, the lamina membranaceous, rhomboid-oblong, 17–22 mm long, 7.5–8.5 mm wide, the base strongly inequilateral, acute or nearly so on both margins, the apex rounded, mucronate; the upper surface green, glabrous, the under glaucous and minutely pubescent; lateral veins on each side of the midrib 4–7, obscure; stipules linear-lanceolate, 2.5 mm long, pubescent.

MINDORO, Pinamalayan, *For. Bur. 5370 Merritt* (type); Calausan, *For. Bur. 8789 Merritt;* without further locality, *For. Bur. 8606 Merritt.*

16. **Phyllanthus blancoanus** Muell.-Arg. in Linnaea **32** (1863) 49, prob.; Merr. in Philip. Jour. Sci. **1** (1906) Suppl. 74, certe.

P. niruri Blanco Fl. Filip. (1837) 690; non Linn. Sp. Pl. (1753) 981.

P. tetrander Blanco l. c. ed. 2 (1845) 480; non *P. tetrandrus* Roxb. Fl. Ind. **3** (1832) 674.

LUZON, Province of Pampanga, Mount Arayat, *Merrill 3830, Bolster 98:* Province of Rizal, Bosoboso, *For. Bur. 2698 Ahern's collector:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3179, 3751, Whitford 237, Williams 423.*

Phyllanthus tetrander Blanco is merely his own correction of his identification of *P. niruri* in the first edition, the description being unchanged. Mueller, considering that this also was wrong, renamed the species, basing *P. blancoanus* entirely upon Blanco's descriptions, with some suggested corrections. He placed the species in the section *Eriococcus,* where the present plants belong. Unless perhaps by F.-Villar, the species was first identified with herbarium material by Merrill in the "Lamao Flora," and it is the species so identified by him that is here accepted, after careful reëxamination of the material. There is one important difficulty: Blanco describes the leaves, called by him leaflets, as linear, which

does not at all agree with those of this species. An explanation may be that Blanco, having decided that his plant was *P. niruri*, described the leaves as they are in the latter, a procedure which he sometimes adopted: conversely, it would be difficult to see how he could have called this species *P. niruri* when the leaves were so different, had he not subsequently changed the name to *P. tetrander*, presumably believing that he had Roxburgh's species, whose leaves are described as "broad-lanceolar, ... 2 to 4 inches long." In every other respect, the species markedly agrees with Blanco's description, as interpreted by Mueller; and the other Philippine species closely approaching it, to which the description might almost equally well apply, are ones which Blanco can hardly have seen. In one respect Mueller wrongly described this species, in saying that the ovary is glabrous, a pure assumption on his part, as Blanco makes no reference to the point. It is accordingly thought desirable to append a partial description, especially of the flowers and leaves.

Male flowers toward the base of the branches, borne on pedicels 2–4 mm long: perianth-segments 4, lanceolate or sagittate, fimbriate, about 2 mm long; disk-glands 4, separate, shallow, discoid; filaments short, united, anther-cells (not anthers) 4, dehiscing transversely; rudiment of the ovary present but minute: female flowers in fascicles of 2 or 3, not seen near the bases of the branchlets, the pedicels about 1 cm long, conspicuously thickened near the apex; perianth-segments 6, united, at the extreme base with a rounded sinus, linear-lanceolate, 3.5 mm long, the margins dentate-fimbriate except toward the somewhat narrowed base; disk thin, annular, but with 6 projections alternating with the perianth-segments, these projections shortly but widely stalked, suborbicular or notched, thickened at the apex; ovary villose, globose, 1–1.5 mm in diameter, 3- and less conspicuously 6-grooved, 3-celled, each cell containing 2 ovules, which are nearly oval in outline, about 0.6 mm long, with a brown testa; styles 3, bifid nearly to the base, the style-arms linear, about 0.5 mm long: leaves rhombic-oblong, usually broadest opposite the base, strongly inequilateral, those near the base of the branches the smaller, the rest 13–21 mm long, 4.5–8.5 mm wide, the lower margin nearly straight or at the extreme base slightly convex, the upper margin forming nearly a right angle with it, the apex of the leaf rounded, apiculate.

17. **Phyllanthus laciniatus** sp. nov. § *Eriococcus*.

Floribus masculinis mediocriter pedicellatis, fasciculatis; perianthii segmentis 4, laciniato-fimbriatis; filamentis brevissimis, connatis, antheris 2, horizontaliter dehiscentibus: floribus femineis solitariis vel geminatis, longiter pedicellatis; perianthii segmentis 6, masculinis similibus; glandulis 6, subliberis; ovario obscure pubescente, 3-loculari: foliis breviter petiolatis, rhombeo-ovoideis vel ellipticis, basi acutis vel rotundatis, apice mucronatis.

Male flowers in fascicles of 4–8, borne on slender glabrous pedicels 4–7 mm long; perianth-segments 4, ovate, 2 mm long, the margins laciniate-fimbriate; glands 4, free, flattened, 1 mm wide at the outer margin,

minutely tuberculate; staminal column extremely short, the filaments united, the 4 anther-cells forming a broken ring around the apex and dehiscing horizontally, surrounding a minute rudiment of the ovary: female flowers solitary or paired, borne on pedicels 12–28 mm long; perianth-segments 6, similar to those of the male, 3 mm long; glands 6, oblong or oblanceolate, 1 mm long, almost free but united at the base to a very shallow ring which completely surrounds the ovary; ovary globose, very obscurely pubescent, 1 mm in diameter, 6-lobed, 3-celled; styles 3, free, forking into 2 slender lobes about 0.5 mm long almost immediately above the ovary: capsule white, depressed-globose, 8 mm in diameter, glabrous, horny in texture, 6-lobed, 3-celled; seeds 4 mm long, outer wall of the testa composed of horizontal fibres, easily ruptured and giving the appearance of brownish pubescence or minute tubercles.

A shrub 1–3 m high, the branches grayish or brownish, terete, somewhat striate, more or less pubescent: leaves borne on pubescent petioles less than 1 mm long, the lamina chartaceous, rhombic-ovate to elliptic, 2.5–4 cm long, 1.3–1.8 cm wide, or some of the leaves smaller, equilateral or strongly inequilateral and acute or rounded at the base, the margins slightly recurved and ciliate, the apex mucronate, the upper surface green, glabrous, the under glaucous, pubescent especially on the veins; lateral veins on each side of the midrib 4–6, anastomosing well within the margins; stipules lanceolate or linear-lanceolate, 2 mm long, acuminate, pubescent.

LUZON, Province of Albay, Batan Island, Batan, *Bur. Sci. 6230 Robinson.*

This species forms with *P. blancoanus*, *P. stipularis*, *P. mindorensis* and *P. leytensis*, a very natural group, all showing the same arrangement of stamens and styles, and having a minute rudiment of the ovary at the apex of the column formed by the short united filaments.

18. **Phyllanthus leytensis** Elmer Leafl. **1** (1908) 307.

Monoicus: floribus masculinis pedicellis gracilibus 4–6 mm longis suffultis, perianthii segmentis 4, triangulari-ovatis, fimbriatis; disci lobis 4; filamentis tota longitudine connatis; antheris 2 (loculis 4), transversaliter dehiscentibus: floribus femineis in pedicellis gracilibus apice incrassatis circiter 2–3 cm longis suffultis; perianthii segmentis 6, ovatis, fimbriatis; disco annulari, superiori margine 6-lobato; ovario minute papilloso-pubescenti, 3-loculari: foliis brevissime petiolatis, rhomboideo-oblongis, apicem versus latioribus, valde inaequilateralibus, margine inferiori incurvatis, apice rotundatis apiculatisque, circiter 2 cm longis, 7–12.5 mm latis, inferioribus minoribus.

LEYTE, Palo, *Elmer 7267.*

19. **Phyllanthus buxifolius** Muell.-Arg. in Linnaea **32** (1863) 50.

Scepasma buxifolia Blume Bijdr. (1825) 583.

LUZON, Province of Zambales, Subig, *Hallier s. n.:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 2532, Whitford 45, Williams 43, Bur. Sci. 1649*

Foxworthy, For. Bur. 1501 Ahern's collector, For. Bur. 2932 Borden, For. Bur. 3010 Meyer: Province of Rizal, *Bur. Sci. 2077 Ramos:* Province of Tayabas, (Infanta) Tinuan River, *Whitford 765;* Pagbilao, *Merrill 1912.* CEBU, Toledo, *Bur. Sci. 1721 McGregor.*

N. v. *Cahoy cahoyan,* Tag., Bataan; *Agaooyoy,* Tag., Tayabas.

Java.

SPECIES VALDE DUBIÆ.

PHYLLANTHUS NIGRESCENS Muell.-Arg. in DC. Prodr. **15**[2] (1866) 348.

Kirganelia nigrescens Blanco Fl. Filip. (1837) 712.

Nothing nearly answering the description of this species can be found, even if the points on which errors might easily be made are treated very loosely. The two most likely identifications seem to be with *Breynia cernua* and *Glochidion urophylloides*, neither quite impossible. Assuming what is probable, that the species is represented in our collections, the former is perhaps the species in which a writer could be most easily forgiven for counting the 6 perianth-segments as 4, his 6-celled berry with one seed in each cell may be the 3-celled berry with 2 seeds in each, the anthers are 3 not 5, the fruit is black in the herbarium, though red in nature, and his specimen might have been dry. *G. urophylloides* answers the description better, but not nearly, and he is unlikely to have had it. Fernandez-Villar reduced it to *Glochidion molle* Bl., which is certainly wrong, and would in any case lose much of its value as there is great reason to believe that Villar misinterpreted the latter species.

PHYLLANTHUS PUMILUS Muell.-Arg. in DC. Prodr. **15**[2] (1866) 349.

Kirganelia pumila Blanco Fl. Filip. (1837) 713.

Previous suggestions for the reduction of this species have been *P. urinaria*, *P. simplex*, and *P. niruri*, these well fitting the specific name, but not the description. If it be a *Phyllanthus* at all, these have probability in the order given: Blanco is believed to have described the last under another name. He apparently considered the present species to be a *Glochidion*, but the difficulties in this genus are ever greater. It may belong altogether outside of this group. Mueller's names for this and the preceding were merely transfers of Blanco's, and by him both were considered very doubtful.

SPECIES EXCLUDENDÆ.

PHYLLANTHUS PHILLYREAEFOLIUS Poir. Encycl. **5** (1804) 299.

According to Mueller, erroneously credited to the Philippines on some sheets of Perrottet's collections, and actually known only from the Mascarenes.

The following, the majority belonging to *Glochidion,* were enumerated among Philippine species by Fernandez-Villar,[1] but have not been found by other collectors, and were probably wrongly interpreted.

P. COMPRESSICAULIS Muell.-Arg. in Flora **48** (1865) 376.
P. ERIOCARPUS Muell.-Arg. in Flora **48** (1865) 387.
P. GAUDICHAUDII MARIANUS Muell.-Arg. in Flora **48** (1865) 379.
P. INSULANUS Muell.-Arg. in Flora **48** (1865) 387.
P. LEUCOGYNUS Muell.-Arg. in Flora **48** (1865) 75.
P. MARIANUS Muell.-Arg. in Linnaea **32** (1863) 17.
P. MULTILOCULARIS Muell.-Arg. in Flora **48** (1865) 370.
P. PULCHER Muell.-Arg. in Linnaea **32** (1863) 49.

[1] Noviss. App. (1883) 187–189.

5. CICCA Linn.

Cicca disticha Linn. Mant. (1767) 124.
Phyllanthus distichus Muell.-Arg. in DC. Prodr. **15**[2] (1866) 413.
Cicca acidissima Blanco Fl. Filip. (1837) 700.
Phyllanthus acidissimus Muell.-Arg. in Linnaea **32** (1863) 50, non Noronh. in Verh. Batav. Gen. **5**[4] (1790) 22.
Phyllanthus acidus Merr. in Govt. Lab. Publ. (Philip.) **8** (1903) 41, sphalm.
LUZON, Province of Ilocos Norte, *Bur. Sci. 2281 Mearns:* Province of Union, Bauang, *Elmer 5641:* Province of Rizal, Manila, *Loher 4753, Ahern 709, Merrill 3804, For. Bur. 12464 Curran:* Province of Tayabas, Pagbilao, *Merrill 1909.* MINDORO, Mamburao, *For. Bur. 8612 Merritt;* without further locality, *For. Bur. 8558 Merritt.*

The fruits of this species are fleshy externally, containing a 6- or 8-grooved bony endocarp, firmly united, and not separable by pressure, showing however by traces of the original carpellary walls on its exterior that it represents either 3 or 4 carpels, and containing 3 or 4 cells each with one seed. It is well represented by the figure of Lamarck,[2] and less distinctly by that of Vidal.[3] Further, Blanco's description of *Cicca acidissima* is unusually good.

Although this species, along with others later described as cogeneric with it, was placed by Mueller in *Phyllanthus,* it seems clearly separable from that genus, by the structure of its fruit. Blanco described it as dioecious, and that is the testimony of all recent Philippine collections. From Mueller's description it would seem that he had male flowers, with which female flowers were occasionally found, for he implies that the latter are very few, and only found at the bases of the branches. In our material, they are exceedingly numerous. Hooker[4] says that he had not seen the fruit; the statements of Roxburgh and Kurz, cited by him, agree well with the views here maintained.

Kurz[5] has already revived this Linnaean genus, but with wider limits than here, where it is restricted to such species ordinarily placed in *Phyllanthus* as have drupaceous fruit, and of these there is but one known in the Philippines. His other species of *Cicca* are here either in *Fluggea* or *Phyllanthus* (*P. reticulatus*).

N.v. *Iba,* Tag., Pamp.; *Banquilin,* Tag.; *Carmay,* Tag., Mindoro; *Poras, Layohan, Caguíndi,* Vis.

India, Malaysia, and Madagascar.

6. GLOCHIDION Forst.

This genus is a very unsatisfactory one, nearly every species showing wide variation, and at the same closely paralleling others, so that it is necessary to place together collections which markedly differ in characters considered to be nonessential in *Glochidion,* though often highly significant elsewhere, while others nearly identical with them in these respects are treated as widely separated. In Philippine material this is especially the case with the series of forms here placed as *G. album* and *G. trichogynum,* but in less degree the same is true of many others. The division

[2] Lam. Encycl. Méth. *pl. 757.*
[3] Vidal Synopsis Atlas *pl. LXXXII, f. D.*
[4] Hooker f. Fl. Br. Ind. **5** (1887) 305.
[5] For. Fl. Br. Burma **2** (1877) 351.

into sections, although based upon so variable a character as stamens 2–4, and stamens 4–6, seems to hold good. As elsewhere stated, no plant has been found with both 3-anthered and 5-anthered flowers, and no flowers have been found with 4 anthers except on plants which had also flowers with either 3 or 5. Further division is a matter of great difficulty, and is based upon the styles, the most natural character available. In use, its drawbacks are that by the growth of the ovary, the stylar column remaining nearly unchanged or withering, the proportions become greatly changed; further, that very slight differences at the apex make it subconic, cylindric, or clavate, changes not unlikely to be produced by pressure in drying or otherwise. It is difficult to resist the conviction that such species as *G. album, G. trichogynum,* and *G. latistylum,* which have nearly as great a stylar variation as that of the genus, have nevertheless had a comparatively recent common ancestry. The entire series seems to show that it is emerging from a state of great instability, the species tending to differentiation by means of the styles, and from that standpoint the present attempt at classification has been made.

KEY TO THE PHILIPPINE SPECIES OF GLOCHIDION.[6]

Anthers 4–6, usually 5, never 3. (§ EUGLOCHIDION.)
- Styles free, longer than the ovary ..... 1. *G. quinquestylum*
- Styles often becoming free, shorter than the glabrous ovary .. 2. *G. urophylloides*
- Styles forming a definite column.
  - Stylar column thicker above, ovary glabrous ..... 3. *G. lancifolium*
  - Stylar column not thicker above, ovary pubescent.
    - Ovary 4- or 5-celled ..... 4. *G. angulatum*
    - Ovary 10–12-celled ..... 5. *G. littorale*

Anthers 2–4, usually 3, never 5. (§ HEMIGLOCHIDION.)
- Styles free.
  - Styles narrowed upward ..... 6. *G. triandrum*
  - Styles slightly dilated upward ..... 7. *G. psidioides*
- Styles forming a lobed or almost entire column.
  - Stylar column as broad as ovary, strongly constricted at base.
    - Leaf-bases shallowly cordate ..... 8. *G. latistylum*
    - Leaf-bases acute ..... 9. *G. coronulatum*
  - Stylar column at base as broad as ovary, not or only slightly constricted. (See also Nos. 19 and 26, if the flowers are very young.)
    - Stylar column nearly same length as ovary.
      - Stylar column wider at apex, deeply lobed.
        - Ovary glabrous ..... 10. *G. llanosii*
        - Ovary densely pubescent ..... 11. *G. molle*
      - Stylar column narrowed above.
        - Capsule greatly depressed, the styles forming an apical disk. 12. *G. williamsii*
        - Capsule slightly depressed, the styles forming an apical point. 13. *G. breynioides*

[6] *G. reticulatum* is not here included, as its female flowers and capsules are unknown.

Stylar column much longer than ovary.
Stylar column deeply lobed..... 14. *G. longistylum*
Stylar column inconspicuously lobed..... 15. *G. trichogynum*
Stylar column at base narrower than ovary.
Stylar column wider at apex.
Stylar column at least twice as long as ovary.
Capsules less than 1 cm in diameter..... 16. *G. benguetense*
Capsules 2 cm or more in diameter..... 17. *G. subfalcatum*
Stylar column about same length as ovary.
Capsules small, 4-celled..... 18. *G. mindorense*
Capsules large, at least 8-celled..... 19. *G. album*
Stylar column not wider at apex.
Stylar column 3 times length of ovary..... 20. *G. luzonense*
Stylar column little or not longer than ovary.
Ovary glabrous.
Ovary 5-celled ..... 21. *G. camiguinense*
Ovary 7- or 8-celled..... 22. *G. merrillii*
Ovary pubescent.
Capsules about 6-sulcate.
Ovary 3–5-celled.
Female perianth-lobes not exceeding 2.5 mm..... 23. *G. rubrum*
Female perianth-lobes 3.5–4 mm..... 24. *G. malindangense*
Ovary 6-celled ..... 25. *G. curranii*
Capsules 10 or more sulcate..... 26. *G. philippicum*

1. **Glochidion quinquestylum** Elmer Leafl. Philip. Bot. 1 (1908) 303.

Arbor: floribus breviter pedicellatis, fasciculatis; perianthii masculini segmentis 6, antheris 5; perianthii feminei segmentis magis coalitis, ovario glabro vel apice minute pubescente, stylis 5 vel rarius 3, 2 mm longis, fere liberis vel liberis, conicis: capsulis depresso-globosis, 8 mm diametro, 5-locularibus; seminibus 3 mm longis: foliis subdistichis, breviter petiolatis, anguste ellipticis vel anguste oblongis, saepius 7 cm longis, 2.5 cm latis, basi valde inaequilateralibus, altero margine recto, altero incurvato, apice acutis vel obtusis; stipulis crassis, persistentibus, acute acuminatis, 2 mm longis.

Luzon, Province of Benguet, Baguio, *Elmer 8916*. This species presents a most puzzling problem, as it is an almost perfect match for *G. triandrum*, both in its vegetative and floral aspects, except that it has 5 stamens. It was originally so described, and the single male flower upon the specimen in this herbarium confirms the statement. In an examination of a very large number of flowers of this genus, belonging to many species, plants have been found with either 3 or 4 stamens in different flowers, others with either 4 or 5, the former set sometimes also with 2, the latter with 6, but in no single instance have 3-anthered and 5-anthered flowers been found on the same plant. This is the basis for the separation of the sections *Euglochidion* and *Hemiglochidion*, and the distinction elsewhere holds well for Philippine material. As between *G. quinquestylum* and *G. triandrum*, I can not find a single other character, unless that of the pubescence of the ovary and branchlets; in size, shape, texture, pubescence, petioles, and venation of the leaves, perianth, styles, capsules, seeds, no difference can be detected. The ovary is described as glabrous, all those on the specimen here have passed the early stages and the youngest of them are slightly pubescent, as are

often those of *G. triandrum* at a similar stage; the stipules in *G. triandrum* are variable in prominence, and those of *G. quinquestylum* come well within the limits of their variation, the branchlets of *G. quinquestylum* are less pubescent than is usual in *G. triandrum*, but come within the limits of variation in 3-anthered plants. A majority of the collections cited under the latter have male flowers; the others, all fertile, might just as well be placed here, except on grounds of probability.

N. v. *Shimey*, Ig., Benguet.

2. **Glochidion urophylloides** Elmer Leafl. Philip. Bot. 1 (1908) 300.

G. fenicis Merr. Philip. Jour. Sci. 3 (1908) Bot. 414.

Batanes Islands, Batan Island, Santo Domingo de Basco, *Bur. Sci. 3696 Fénix.* Luzon, Province of Cagayan, Aparri, *For Bur. 11278 Klemme:* Province of Isabela, Casiguran, *Bur. Sci. 3113 Mearns:* Province of Benguet, Baguio, *Elmer 8677, 8758:* Province of Rizal, Montalban, *For. Bur. 3408 Ahern's collector.*

The type of *G. urophylloides* is represented in this herbarium by a leaf-bearing branch with a single female flower, but agrees well with the other Benguet specimen, originally distributed under a different name. The species had been already placed by me in the section *Euglochidion*, on account of the peduncled inflorescence of the latter specimen, which is indicated rather than present in the type, before their identity was suspected with the other specimens here cited, each of which has flowers with 4 or 5 anthers. At this time *G. fenicis* was held distinct, and of our specimens it has the largest leaves, but it was subsequently agreed that it was cospecific, though the description had gone too far in type to be withheld. If presence of a Latin diagnosis be insisted upon, it takes precedence of the older name.

The identity of this species with *G. lanceolatum* Hayata being suspected, material of the numbers which seemed to me to approach most nearly the description of the latter was sent to Dr. Hayata, who has courteously compared it with the type, and believes that in spite of the similarity the species are distinct, the Formosan plant having larger capsules, less clustered flowers and much smaller leaves.

The leaf variation of the species as here interpreted is considerable, the length varying from 5 to 16 cm, and the width from 2 to 6 cm.

N. v. *Annam*, Batanes Islands; *Cangil*, Neg., Cagayan.

3. **Glochidion lancifolium** sp. nov. § *Euglochidion.*

Floribus pedunculatis, pedicellatis, perianthii segmentis 6, biseriatis: florum masculinorum antheris 4–6; florum femineorum ovariis 5-locularibus, columnis stylaribus basi angustatis apice incrassatis ovaria juniora aequantibus, mox eis conspicue angustioribus: arbor parva, glabra, foliis oblongis vel lanceolatis, apice breviter acuminatis.

Flowers of both sexes in the same or different fascicles, borne on short thickened peduncles usually arising 2–10 mm above the axils, the pedicels of the male flowers about 1 cm long, those of the female flowers 3–5 mm long: perianth of the male flowers 6-parted, the segments of the outer row slightly larger than those of the inner, 2.3 mm long, ovate, rounded at the apex; anthers 5, more rarely 4 or 6, 0.6 mm long, the connective produced about 0.2 mm: perianth-segments of the female flowers 6, biseriate, lanceolate to ovate, 1.3–1.5 mm long, rounded and often apiculate at the apex, ovary glabrous, strongly 10-grooved, in the youngest

flowers subglobose, 1 mm in diameter, the stylar column then almost equal to it, crown-shaped, soon by the widening of the ovary much narrower than it and often subhemispherical, 0.8 mm long, 5-grooved: capsules depressed-globose, 4 mm long, 8 mm in diameter, 10-grooved, 5-celled, the seeds 3 mm long.

A tree attaining a height of 8 m with a trunk 20 cm in diameter, glabrous throughout, the ultimate branchlets purplish or blackish, angled or very narrowly winged: leaves borne on petioles 4–5 mm long, the lamina subcoriaceous, oblong-lanceolate or lanceolate, 8.5–12.5 cm long, 3.5–5 cm wide, at the apex abruptly contracted into a narrow acumen 1 cm long or less, at the equilateral or slightly inequilateral base acute, truncate, or slightly cordate, and when viewed from the upper surface seen to wing the petiole very narrowly, usually to its insertion, the upper surface bluish-green, the under surface usually more or less brownish when dry; primary lateral veins on each side of the midrib 7–10.

LUZON, Province of Ilocos Norte, *For. Bur. 13831 Merritt & Darling:* Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 2716 Borden:* Province of Rizal, Bosoboso, *For. Bur. 2006 Ahern's collector;* Bosoboso-Tanay trail, *For. Bur. 10041 Curran:* Province of Tayabas, Pagbilao, *Merrill 1973:* Province of Camarines, Nueva Caceres, *For. Bur. 10427 Curran;* Pasacao, *Ahern 202.* GUIMARAS, Nagaba, *For. Bur. 297 Gammill* (type). MINDORO, Iriron, *For. Bur. 8852 Merritt.*

Closely allied to *G. zeylanicum* (Gaertn.) A. Juss., of which I have no material for comparison. To W. W. Smith, Esq., of the Royal Botanic Gardens, Calcutta, I am greatly indebted for the following note. "*For. Bur. 297 Gammill* does not agree with our (3) types of this (S. India, Perrottet's collection), it has quite a different facies and all ours are besides very pubescent. *G. nitidum* Dalz. & Gibs., (considered a glabrous state of *G. zeylanicum* by Hooker but not by King), is still more distinct."

N.v. *Dampul,* Tag., Tayabas; *Cacana,* Tag., Rizal; *Mambulao* or *Sibulao,* Vis., Guimaras.

4. **Glochidion angulatum** sp. nov. § *Euglochidion.*

Arbor parva vel frutex pubescens: floribus numerosis, pedicellatis, pedunculis extra-axillaribus suffultis; masculinis pedicellis 8-10 mm longis suffultis, antheris 4 vel 5; femineis pedicellis brevioribus crassioribus suffultis, ovario depresso-globoso, pubescente, 4- vel 5-loculari, columna stylari subovoidea: foliis lanceolatis vel ellipticis, basi rotundatis vel acutis, apice breviter acuminatis.

Flowers in subumbellate fascicles, borne on peduncles 5–7.5 mm long, inserted above the leaf-axils, a few fascicled male flowers rarely intervening, both sexes often in the same fascicle: male flowers borne on slender pedicels 8–10 mm long, perianth-segments 6, in two rows, ovate or elliptic, the apex rounded or acuminate, those of the outer 2–2.5 mm long, the inner somewhat smaller; anthers 4 or 5, 1 mm long, the connectives shortly produced: female flowers on stouter pedicels 2.5–3 mm long, perianth-segments 6, in two rows, similar to those of the male; ovary depressed-globose, 1.5–2 mm in diameter, pubescent, 4- or 5-celled; stylar

column broadly ovate in outline, 0.5–1 mm long, 1 mm in diameter at the base, obscurely lobed: capsules thick-walled, depressed-globose, slightly grooved, 4 mm long, attaining a diameter of 7.5 mm, 4- or 5-celled, pubescent.

A shrub or small tree, more or less densely covered with short pubescence in all its parts, its branchlets angled; leaves borne on petioles 4–7 mm long, the lamina chartaceous, lanceolate or elliptic, 10–14 cm long, 3.5–6.5 cm wide, the nearly equilateral base acute or rounded, the apex obtusely acuminate, the under surface nearly glabrous except on the principal veins; primary lateral veins on each side of the midrib 6–9; stipules thick, lanceolate, falcate, 2 mm long.

LEYTE, Palo, *Elmer 7279.* MINDANAO, District of Davao, Davao, *De Vore & Hoover 213:* Lake Lanao, Camp Keithley, *Mrs. Clemens, s. n.:* District of Zamboanga, Port Banga, *For. Bur. 9487 Whitford & Hutchinson* (type). BASILAN, Santa Isabela, *DeVore & Hoover 21.*

Probably most closely allied to *G. hirsutum* Muell.-Arg.

5. **Glochidion littorale** Blume Bijdr. (1825) 585.

Phyllanthus littoralis Muell.-Arg. in Flora **48** (1865) 370.

LUZON, Province of Tayabas, Lucena, *Whitford 596;* Gumaca, *Whitford 895.* MINDORO, Baco, *Merrill 1230;* Pola, *Merrill 2391;* Bongabong River, *For. Bur. 4115 Merritt;* Selonay River, *For. Bur. 5319 Merritt.* PANAY, Capiz, *Copeland 127.* MINDANAO, Province of Surigao, Surigao, *Ahern 502, 526;* Placer, *Ahern 402.*

The Philippine specimens agree well one with another, and almost as well with the descriptions of Blume and Mueller. The anthers on different plants run 4 or 5, 5, 5 or 6, 6.

N.v. *Sagasa, Bugnay, Cayongcong,* Vis., Surigao.

India and Malaysia.

6. **Glochidion triandrum** comb. nov.

Kirganelia triandra Blanco Fl. Filip. (1837) 711.

Phyllanthus triandrus Muell.-Arg. in Flora **48** (1865) 379.

Glochidion eleutherostylum Muell.-Arg. in Linnaea **32** (1863) 69.

LUZON, Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 1427 Ahern's collector, Leiberg 6106:* Province of Rizal, Bosoboso, *Merrill 1882:* Province of Laguna, Calauan, *Cuming 509:* Province of Tayabas, Gumaca, *Whitford 885;* Malicboi, *For. Bur. 10751 Curran, Ritchie 8 M;* Guinayangan, *Merrill 2058:* Province of Camarines, Pasacao, *Ahern 161:* Province of Albay, Batan Island, Batan, *Bur. Sci. 6229 Robinson.* GUIMARAS, Nagaba, *For. Bur. 318 Gammill.* NEGROS, Namunbon, *For. Bur. 11232 Everett.* MINDORO, Mount Teluto, *For. Bur. 11431 Merritt.*

N.v. *Bagna,* Tag., Bataan, Rizal; *Alipote, Dampol,* Tag., Tayabas.

7. **Glochidion psidioides** sp. nov. § *Hemiglochidion.*

Frutex, ramulis dense pubescentibus; floribus axillaribus, dense congestis; floribus masculinis pedicellis hirsutis 3–4 mm longis suffultis, perianthii lobis elliptico-lanceolatis, 2 mm longis, antheris 3; floribus femineis subsessilibus, perianthii lobis 6, valde imbricatis, oblanceolatis vel lineari-oblanceolatis, 2 mm longis, ovario 0.5 mm longo, apice excepto glabro, stylis 5, liberis, basi ovarium latitudine aequantibus, supra paullo

latioribus, 1 mm longis; foliis ellipticis, elliptico-lanceolatis vel ovatis, 2–5 cm longis, 15–22 mm latis.

Flowers of both sexes somewhat crowded in the leaf-axils: male flowers borne on comparatively stout hirsute pedicels 3–4 mm long; perianth-segments 6, elliptic-lanceolate, 2 mm long, hirsute on the outer surface, obtuse or shortly acuminate at the apex; anthers 3, 1 mm long: female flowers subsessile, perianth-segments 6, strongly imbricate, oblanceolate or linear-oblanceolate, 2 mm long, hirsute on both surfaces but only slightly on the inner; ovary glabrous except at the apex, 0.5 mm long, 10-sulcate; styles 5, free but close together, leaving an opening at the somewhat thickened apex, together equaling the ovary in width, 1 mm long, densely hirsute.

A shrub 2 m high, its branchlets somewhat flexuose, densely ferruginous-pubescent; leaves resembling those of *Psidium guajava,* borne on short petioles, the lamina coriaceous, elliptic or elliptic-lanceolate, rarely ovate, 2–5 cm long, 15–22 mm wide, usually inequilateral, at both extremes acute or obtuse, both surfaces more or less pubescent; stipules lanceolate, subacute, nearly 2 mm long.

LUZON, Province of Benguet, Baguio, *For. Bur. 4856 Curran.*
A very distinct species, allied to *G. malabaricum* Bedd.
N.v. *Anam,* Ig., Benguet.

8. **Glochidion latistylum** sp. nov. § *Hemiglochidion.*

Floribus axillaribus, fasciculatis, masculinis pedicellis usque ad 2.5 cm longis suffultis; perianthii segmentis 6, 2 mm longis, oblanceolatis rarius ellipticis, antheris 3; floribus femineis pedicellis 6 mm longis suffultis, perianthii segmentis 6, anguste lanceolatis vel oblanceolatis, ovario depresso-globoso, 1.3 mm diametro, columa stylari basi valde constricta, ovario aequilata sed dimidio longiore, apice sulcata, umbilicata; capsulis magnis, umbilicatis, 7–11-locularibus: foliis oblongo-lanceolatis, magnis.

Male flowers borne on slender pedicels which attain a length of 2.5 cm and are pubescent except near their base; perianth-segments 6, thick, somewhat exceeding 2 mm in length, oblanceolate or rarely elliptic, the base acuminate, the apex cuspidate, pubescent on the outer surafce; anthers 3, 1 mm long, not including the produced connectives: female flowers on stouter pubescent pedicels attaining 6 mm in length, the perianth-segments 6, narrowly lanceolate or oblanceolate, 2.5–3 mm long, pubescent on both surfaces; ovary densely but inconspicuously pubescent, 0.8 mm long, 1.3 mm in diameter, stylar column as wide as the ovary but one-and-a-half times as long, strongly constricted at the base, globose-ovate in outline, pubescent except at the glabrous truncate umbilicate obscurely many-notched apex: capsules densely short-pubescent, 1.5 cm long, exceeding 2 cm in diameter, 7–11-angled with corresponding intervening grooves, 7–11-celled, umbilicate at the apex; seeds 7 mm long, the testa dark-red, minutely granular.

Probably a shrub, the branchlets more or less angled, striate, ferruginous-pubescent: leaves borne on petioles 3–4 mm long, the lamina coriaceous, oblong-elliptic, attaining a length of at least 17 cm, 6–8 cm wide, the more or less inequilateral base shallowly cordate, the upper surface glabrous except on the midrib, the under surface pubescent; lateral veins about 10; stipules obliquely linear-lanceolate, 6 mm long, pubescent.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 340.*

In general appearance similar to *G. album* and *G. trichogynum,* but distinguished by the very striking character of the stylar column.

9. **Glochidion coronulatum** sp. nov. § *Hemiglochidion.*

Floribus breviter pedicellatis, perianthii segmentis 6, staminibus 3, ovario depresso-globoso, minute puberulo, columna stylari ovario simili, 6-lobata: foliis ellipticis vel ovalibus, basi acutis, apice breviter obtuseque acuminatis.

Flowers few in a fascicle, borne on pedicels about 1 mm long: perianth-segments of the male flowers 6, in two rows, ovate or broadly ovate, the apex very shortly obtusely acuminate, the largest about 1 mm long; stamens 3, with the produced connective 0.8 mm long: perianth-segments of the female flowers also 6, in two rows, ovate, the apex obtusely acuminate, attaining 2 mm in length; ovary depressed-globose, at anthesis about 1 mm in diameter, stylar column similar to the ovary in size and outline or very slightly longer, constricted at the junction, separable for a variable distance from the apex into usually 6 slightly notched lobes, umbilicate, its base and the ovary minutely pubescent: capsules red, minutely pubescent or glabrescent, deeply 5–7-lobed, 5–7-celled, the style persisting in the umbilicate apex; seeds 4 mm long.

A shrub or tree, 3 m high, its terete or somewhat angled branches covered with grayish-brown or brown bark, more or less striate and lenticellate, the vegetative parts glabrous at least when mature: leaves borne on petioles 2–4 mm long, the lamina subcoriaceous, elliptic or oval, 4–8 cm long, 2–4 cm wide, the base acute, the apex shortly and obtusely acuminate; primary lateral veins on each side of the midrib 6–8; stipules lanceolate, obtusely acuminate, 1 mm long.

LUZON, Province of Ilocos Norte, Vintar, *For. Bur. 13937* (type), *12498 Merritt & Darling:* Province of Benguet, Sablan River, Baguio, *Bur. Sci. 5830 Ramos.*

Similar in general appearance to *G. rubrum* and *G. merrillii,* but distinguished by the stylar colum.

10. **Glochidion llanosii** Muell.-Arg. in Linnaea **32** (1863) 68.

Phyllanthus llanosii Muell.-Arg. in Flora **48** (1865) 387.

Kirganelia villosa Blanco Fl. Filip. (1837) 712, nec *Glochidion villosum* Miq. Fl. Ind. Bat. 1^2 (1859) 376, nec *Phyllanthus villosus* Poir. Encycl. **5** (1804) 297.

Phyllanthus pubescens Klotzsch in Nov. Act. Nat. Cur. **19** Suppl. **1** (1843) 420, non Moon Cat. Pl. Ceyl. (1824) 65.

Glochidion molle Merr. For. Bur. Bull. (Philip.) **1** (1903) 29, non Blume Bijdr. (1825) 586.

Phyllanthus mollis F.-Vill. Noviss. App. Fl. Philip. (1883) 188, quoad synonyma saltem, non Muell.-Arg. in Flora 48 (1865) 387.

LUZON, Province of Ilocos Norte, Nagpartian, *For. Bur. 15523 Merritt & Darling:* Province of Zambales, Subig, *Hallier s. n.:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3131, Elmer 6860, For. Bur. 1774 Borden, For. Bur. 2289 Meyer:* Province of Rizal, Bosoboso, *For. Bur. 3349 Ahern's collector, Bur. Sci. 1014 Ramos:* Province of Camarines, Pasacao, *Ahern 73* (not *173*). BOHOL, Guindulmán, *Bur. Sci. 1236 McGregor.*

Very closely allied to *G. molle* Blume, distinguished not only by the glabrous ovary, but by the shorter, less deeply cut, and wider perianth-segments.

N. v. *Camias camiasan,* Tag., Rizal; *Banitan, Talicud,* Tag., Bataan.

11. **Glochidion molle** Blume Bijdr. (1825) 586.

Phyllanthus mollis Muell.-Arg. in Flora 48 (1865) 387.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9161 Whitford & Hutchinson.* BASILAN, Santa Isabela, *DeVore & Hoover 63, Hallier s. n.* MALAMAUI, *Moseley* (Challenger Expedition) *s. n.*

N. v. *Bugna,* Moro, Basilan.

Java, Celebes.

12. **Glochidion williamsii** C. B. Robinson in Philip. Jour. Sci. 3 (1908) Bot. 199.

LUZON, Province of Benguet, Baguio, *Williams 953, For. Bur. 4927 Curran:* Province of Zambales, Mount Tapulao, *Bur. Sci. 5097 Ramos:* Province of Bataan, Mount Mariveles, Lamao River, *Whitford 1172, 1327, s. n.*

The stylar column forms a continuation of the ovary, the styles curving inward and usually downward at the apex, leaving a central depression; the capsules are strongly depressed, 8–9 mm in diameter, 4–6-celled, 8–12-lobed, at the apex with a circular disk, concave at least near its margins, formed from the stylar column. It has been a matter of doubt whether this was really a normal state, but the capsules mature, and the same structure has been found in different localities. The original description of the capsules does not apply, having been taken from a plant now referred to a different species.

N. v. *Sangk,* Ig., Benguet.

13. **Glochidion breynioides** sp. nov. § *Hemiglochidion.*

Floribus fasciculatis, axillaribus, pedicellis superne dilatatis suffultis, perianthii segmentis utriusque sexus lanceolatis vel oblongo-lanceolatis, antheris 3; ovario glabro, columna stylari ei subæquilata, ovoidea; foliis lanceolatis vel ellipticis, basi inæquilateralibus, obtusis vel acutis, apice acuminatis.

Flowers usually few in a fascicle, those of both sexes borne on pedicels 3–4.5 mm long, those of the female conspicuously thicker above, usually on very short axillary peduncles; perianth-segments of the male flowers 6, lanceolate or oblong-lanceolate, 1.2–1.5 mm long, obtuse at the apex; anthers 3, 1 mm long including the connectives: female flowers with perianth like the males; ovary glabrous, depressed-globose, stylar column at the base slightly wider or slightly narrower than the ovary, nearly ovate in outline, truncate above, about the same length as the ovary, 5- or 6-grooved, with as many inconspicuous intervening grooves: capsules depressed-globose, glabrous, 7 mm in diameter, 5- or 6-celled, the outer walls thin.

A tree attaining a height of 15 m and a trunk diameter of 25 cm, its branchlets covered with yellowish-brown bark, terete, only slightly striale: leaves borne on petioles 3–5 mm long, the lamina chartaceous, lanceolate or elliptic, often oblique, 3.5–7.5 cm long, 1.5–3.5 cm wide, the base inequilateral, usually strongly, rounded on one or both sides, the apex acuminate, the under surface paler than the upper, often glaucous; primary lateral veins on each side of the midrib 6 or 7.

Luzon, Province of Ilocos Sur, Balitny River, *For. Bur. 14042 Merritt & Darling:* Province of Pangasinan, Eguia, *For. Bur. 8290 Curran & Merritt:* Province of Rizal, Mount Santander, *Bur. Sci. 3285 Ramos:* Province of Bataan, *For. Bur. 2772 Meyer:* Province of Sorsogon, *For. Bur. 10528 Curran.* Mindoro, Mountain southeast of Abra de Ilog, *For. Bur. 8781 Merritt* (type); near Naujan, *For. Bur. 8781 Rosenbluth.*

Very similar in general appearance to *G. triandrum*, but at once distinguished by the styles; much more closely allied to *G. mindorense*, which seems to differ by having larger very nearly equilateral leaves borne on thicker petioles, by having a slightly pubescent ovary, styles thicker at the apex than at the base, and pedicels of equal diameter throughout; it is sufficiently separated from *G. camiguinense* by its capsules.

N. v. *Baguiroro*, Bic., Sorsogon.

14. **Glochidion longistylum** sp. nov. § *Hemiglochidion.*

Frutex, ramulis substrigosis: floribus breviter pedicellatis; perianthii masculini segmentis 6, lanceolatis vel ovatis, 1.5 mm longis, antheris 3; perianthii feminei lobis 6, lanceolatis, 2.5 mm longis, ovario parvo, subgloboso, glabro, 4-loculari, in columnam stylarem 4 mm longam, 4-fidam vix angustato: foliis elliptico-lanceolatis, 7–10 cm longis, 3 cm latis, venis utrinque 7 vel 8; stipulis lineari-lanceolatis, 4 mm longis.

Flowers axillary, fascicled, the male borne on pedicels not exceeding 1.5 mm in length, the female subsessile: perianth-segments of the male flowers 6, ovate to lanceolate, 1.5 mm long, obtuse at the apex; anthers 3: perianth-segments of the female flowers 6, 2.5 mm long, lanceolate, obtuse or subacute at the apex, their outer surface hirsute especially on or near the midvein, and the outer often ciliate on the margins; ovary subglobose, 0.6 mm in diameter, 8-grooved, 4-celled, passing with hardly any constriction into a stylar column of almost equal diameter, 4 mm long, its lower half or more entire, then forming 4 lobes, all or some of which are again 2-lobed for nearly 0.5 mm at the apex, the ovary glabrous but the basal third of the stylar column tomentellose.

A shrub 3 m high, its branchlets dark-gray, striate, the younger substrigose, the older subglabrous: leaves borne on rather stout petioles 3–4 mm long, the lamina coriaceous, elliptic-lanceolate, 7–10 cm long, about 3 cm wide, the base subacute and slightly decurrent, the margins often revolute and when dry wavy, at the apex narrowed into an acute acumen about 1 cm long, the upper surface plumbeous, the under when dry brown, both surfaces glabrescent or with scattered hairs; primary lateral veins

on each side of the midrib 7 or 8, those in the middle of the leaf about 1.5 cm apart, forming a definite lateral vein about 3 mm from the margin; stipules acicular-lanceolate, 4 mm long, substrigose.

LUZON, Province of Zambales, Balimbraya, *Bur. Sci. 5057 Ramos.*

Allied to *G. triandrum*, but differing in the stylar column, the pedicels, the shape, texture and venation of the leaves.

15. **Glochidion trichogynum** Muell.-Arg. in Linnaea **32** (1863) 66.

Phyllanthus trichogynus Muell.-Arg. in Flora **48** (1865) 380.

MINDORO, Baco, *Merrill 1235, McGregor 134, 208;* Pola, *Merrill 2204;* Bongabong River, *For. Bur. 3621, 3624, 3645, 3744 Merritt.* MINDANAO, Province of Misamis, *Cuming 1610:* Lake Lanao, Camp Keithley, *Mrs. Clemens 302, s. n.:* District of Zamboanga, Port Banga, *For. Bur. 9099 Whitford & Hutchinson;* Sax River, *Williams 2199.* PALAWAN, Mount Pulgar, *Bur. Sci. 600 Foxworthy.*

The leaf of Cuming's number, which represents the type collection in this herbarium, is more pubescent than those of any of the others here cited, they being glabrous with one exception which approaches the type in this respect. All agree well in the character of the style, and while the leaves are variable in size and shape, they have a strong general likeness, which would be more satisfying if those of *G. album* did not parallel them. These two species can not possibly be united without abandoning the last hope of separating *Hemiglochidion* into subsections.

N. v. *Tabangan*, Tagb., Palawan.

16. **Glochidion benguetense** Elmer Leafl. Philip. Bot. **1** (1908) 304.

G. sablanense Elmer *l. c.* 306.

Frutex, ramulis griseis plus minusve luteo-pubescentibus; floribus axillaribus fasciculatis vel solitariis, masculinis pedicellis 6–8 mm longis suffultis, perianthii segmentis 6, antheris 3; floribus femineis subsessilibus vel breviter pedicellatis, perianthii segmentis 6, lanceolatis, pubescentibus, ovario dense pubescente, columna stylari 2 mm longa, ovario bis aequante, media inferiore parte cylindracea, pubescente, superiore media parte dilatata, glabra, 4 sulcos conspicuos et 4 sulcos intermedios inconspicuos possidente, 4-apiculata; capsula depresso-globosa, 7–8 mm diametro: foliis chartaceis, oblique lanceolatis vel ellipticis, 1–7 cm longis, 0.6–2.5 cm latis, basi saepius inaequilateralibus, apice conspicue acuminatis vel fere acutis, mucronatis, venis utrinque 5–7.

LUZON, Province of Benguet, Baguio, *Elmer 8665, 8770;* Sablan, *Williams 1380;* Trinidad to Tabio, *For. Bur. 15941 Bacani:* Province of Tayabas, Mount Banahao, *Whitford 996.*

It seems impossible to separate the two series of plants here considered, although at first sight they seem to differ in the size petioles texture and apices of the leaves. The flowers are quite the same, and the additional collections here enumerated unite the types in every particular. The description suggests close alliance with *G. velutinum* Wight, of India, and I am further indebted to Mr. Smith for the following. "Of the 4 allied specimens forwarded none come near typical *G. velutinum* (*nepalense*). The type specimens of Wight and Wallich of this species are quite distinct from these Philippine ones, larger and very pubescent."

N. v., *Sangke*, Ig., Benguet.

17. **Glochidion subfalcatum** Elmer Leafl. Philip. Bot. 1 (1908) 305.

Arbor ramosa, divaricata: floribus axillaribus, fasciculatis, masculinis pedicellis pubescentibus usque ad 6 mm longis suffultis, perianthii segmentis 6, biseriatis, subaequalibus, ovalibus vel ellipticis, 1.5 mm longis, extus pubescentibus, apice rotundatis vel breviter acuminatis, antheris 3, 0.7 mm longis; floribus femineis pedicellis pubescentibus usque ad 3 mm longis suffultis, perianthio circiter 3 mm longo, irregulariter 6-lobato, ovario dense pubescente, depresso-globoso, haud sulcato, 1 mm longo, 1.5 mm diametro, columna stylari pubescente, 2.5 mm longa, clavata, apice 0.7 mm lata, 3-fida, infra tertiam superiorem partem ad 0.5 mm angustata, basi non constricta: capsulis glabris vel subglabris, 7–8 mm longis, 2–3 cm diametro, apice foveolatis, 5-locularibus, circiter 10-sulcatis, apice plus minus alte dehiscentibus, valvis liberatis ascendentibus: foliis petiolis 3–5 mm longis suffultis, laminis subcoriaceis vel coriaceis, lanceolatis vel oblongo-lanceolatis, 10–15 cm longis, 3.5–4.5 cm latis, basi valde inaequilateralibus, altero latere acutis, altero rotundatis truncatis vel subcordatis, apice breviter acuminatis, saepius subfalcatis.

LUZON, Province of Benguet, Baguio, *Elmer 8915;* Sablan, *Elmer 6189, 6221:* Province of Bataan, Mount Mariveles, Lamao River, *Williams 715.*

18. **Glochidion mindorense** sp. nov. § *Hemiglochidion.*

Arbor glabra, ovariis exceptis: floribus axillaribus, fasciculatis, masculinis pedicellis brevibus suffultis, perianthii segmentis 6, ellipticis, obtusis, antheris 3: floribus femineis pedicellis brevibus suffultis vel subsessilibus, perianthii segmentis oblongis vel lanceolatis, ovario minute pubescente, columna stylari breviter clavata, ovario aequilonga sed angustiore: foliis breviter petiolatis, chartaceis, ellipticis vel ovatis, basi acutis, apice acuminatis; stipulis lanceolatis.

Flowers axillary, few in a fascicle, the sexes often intermixed, the male borne on pedicels 2–3 mm long, the female nearly sessile or on pedicels attaining 4 mm: perianth-segments of the male flowers 6, biseriate, obtuse at the apex, elliptic, 1.5 mm long, the inner narrower; anthers 3, 0.6 mm long, including the very shortly produced connectives: perianth-segments of the female flowers 6, biseriate, those of the outer row oblong, those of the inner lanceolate, 2.5 mm long; ovary depressed-globose, 1.5 mm in diameter, minutely pubescent, stylar column shortly clavate, like the ovary 1 mm in length, but narrower than it, minutely pubescent at the base, glabrous at the obscurely 4-grooved slightly umbilicate apex: capsules glabrous or nearly so, depressed-globose, 6 mm in diameter, 4-celled.

A tree attaining a height of 4 m, with a trunk 10 cm in diameter, the vegetative parts glabrous; leaves borne on petioles 2–4 mm long, the lamina chartaceous, elliptic to ovate, 7–11 cm long, 4–6 cm wide, somewhat decurrent at the acute base, acuminate and mucronate at the apex;

primary lateral veins on each side of the midrib 5–7; stipules lanceolate, 1 mm long.

MINDORO, Magasauantubig River, *For. Bur. 12031 Merritt* (type); without locality, *For. Bur. 12223 Rosenbluth.*

19. **Glochidion album** Boerl. Handl. Fl. Ned. Ind. **3** (1900) 275.
Kirganelia alba Blanco Fl. Filip. (1837) 713.
Phyllanthus albus Muell.-Arg. in Flora **48** (1865) 387.
Zarcoa philippica Llanos in Bot. Zeit. **15** (1857) 423; Mem. Real Ac. Ci. Madrid **4** (1858) 501, *pl.*
Glochidion cuminghii Muell.-Arg. in Linnaea **32** (1863) 61.
Phyllanthus cumingii Muell.-Arg. in Flora **48** (1865) 371.
Phyllanthus gigantifolius Vidal Revis.-Pl. Vasc. Filip. (1886) 236.
Glochidion leytense Elmer Leafl. Philip. Bot. **1** (1908) 303.

LUZON, Province of Benguet, Twin Peaks, *Elmer 6448:* Province of Zambales, Subig, *Hallier s. n.:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3162, 3797, 3873, Williams 113, 482, Elmer 6663, Whitford 33, For. Bur. 127 Barnes, For. Bur. 1765 Borden, For. Bur. 2224, 2818 Meyer:* Province of Rizal, Montalban, *Loher 4754;* Bosoboso, *For. Bur. 3374 Ahern's collector;* Antipolo, *Merrill 1329, 1681:* Province of Laguna, Calauan, *Cuming 527;* Los Baños, *Hallier s. n., Alberto s. n.:* Province of Tayabas, Atimonan, *Gregory 67:* Province of Camarines, Pasacao, *Ahern 162, 271.* NEGROS, Gimagaan River, *For. Bur. 5220 Aspillera.* MINDANAO, District of Zamboanga, Sax River, *Williams 2352.* BASILAN, *Hallier s. n.*

The more glabrous forms have the following distribution:

LUZON, Province of Benguet, Baguio, *Elmer 8975:* Province of Laguna, Los Baños, *Elmer s. n.:* Province of Camarines, Pasacao, *Ahern 149, 185, 825:* Province of Albay, Batan Island, Calanaga Bay, *Bur. Sci. 6288 Robinson;* Batan, *Bur. Sci. 6266 Robinson.* LEYTE, Palo, *Elmer 7377a; Mount* Cabalauan, *For. Bur. 12425 Danao.* DINAGAT, *Ahern 460.* MINDANAO, Province of Surigao, Surigao, *Ahern 323, 343.*

After repeatedly examining the flowers of all available material, it has seemed necessary to reduce to one species the variable series of forms here represented. The two main types are represented by *G. cumingii* and *G. leytense,* the former pubescent, the latter nearly glabrous, but the differences seem little more serious than the similar ones in *G. philippicum.* The styles of one extreme are covered at the base by pubescence to such an extent that their real form is obscured, in *G. leytense* they are shortly cylindrical and somewhat narrowed at the apex. It is possible to separate the collections not only into two, but perhaps into six or seven series which grade gradually the one into the other. *G. leytense* has nearly the same range of leaf variation as *G. cumingii,* but its type has the most ovate leaves of any here cited. A specimen not previously cited, *For. Bur. 6496 Klemme,* from Cagayan Province, Luzon, has similar habit, but the styles are more slender, approaching those of *G. trichogynum,* but too short for that species.

There is further difficulty. *Kirganelia alba* was said to have leaves 3 inches long, but in other respects the description fits this species reasonably well, and as Blanco did not otherwise describe this very common species, the identification, first made by Merrill,[7] is very reasonable. Blanco also omitted *G. philippicum,* equally widely distributed, and he may possibly have confused these two, and

[7] *Bur. Govt. Lab. Publ.* (Philip.) **27** (1905) 75.

described under this name the flowers of the one and the leaves of the other: if so, it is to the present species that his name chiefly belongs.

Zarcoa philippica was reduced by F.-Villar to *G. philippinense*, but it is much better placed here.

Mueller's plant had no male flowers, and owing probably to the large leaves (usually about 8 inches long), he placed *G. cumingii* in the section *Euglochidion*. But none of the specimens which best match his type have more than 4 anthers, and the number is nearly always 3. It is curious that Boerlage, in transferring Blanco's specific name to *Glochidion*, placed the species in the subsection *Hologlochidion*, corresponding to *Euglochidion* of Mueller. He can therefore hardly have had the same species, but as he cited *Kirganelia alba* as the original name of the species, his transfer will stand. *G. leytense* is to me the extreme variation in the direction of least pubescence, and the most distinct form of the species. There is a further great resemblance in habit to *G. trichogynum*, but the styles are so very dissimilar that the species can not be united. Yet, even here, there are intermediates, not, however, bridging the gap.

N.v. *Asanasan*, Cag., Cagayan; *Kahoy dalaga*, Tag., Bataan; *Bixia*, Pamp., Bataan; *Calnag, Malaates*, Tag., Rizal; *Polopiñon*, Vis., Negros. More glabrous forms, *Bugna*, Vis., Dinagat, Surigao; *Bagang bagang, Uan-una na puti*, Bic., Camarines.

20. **Glochidion luzonense** Elmer Leafl. Philip. Bot. 1 (1908) 301.

Frutex, ramulis striatis, dense pubescentibus; floribus solitariis—ternis, axillaribus; masculinis pedicellis 5–12 mm longis, gracilibus, pubescentibus suffultis; perianthii segmentis 6, valde imbricatis, lanceolatis, apice obtuse acuminatis, hirsutis, antheris 3, 1 mm longis; floribus femineis sub sessilibus, perianthii segmentis 6, lineari-lanceolatis, 2 mm longis, subacutis, hirsutis, ovario depresso-globoso, 1 mm diametro, hirsuto, columna stylari cylindraceo-conica, supra paullo angustata, hirsuta, apice triloba, ovarium ter aequante; capsulis minus conspicue pubescentibus, 1 cm diametro, 3-locularibus: foliis petiolis brevibus pubescentibus suffultis, laminis junioribus membranaceis, senioribus chartaceis vel subcoriaceis, ovatis, subrotundatis, vel ellipticis, 1–6 cm longis, 1–4.5 cm latis, basi truncatis vel lente cordatis, marginibus plus minusve revolutis, apice rotundatis, obtusis, vel breviter acuminatis, superiore pagina plus minusve puberulis, senioribus saepe scabridis, pagina inferiore sericeis, sub basi 3–7-nerviis, his inclusis venis reticulatis utrinque 4–9; stipulis lineari-lanceolatis, 2 mm longis.

LUZON, Province of Ilocos Norte, Mount Piao, *For. Bur. 13993 Merritt & Darling:* Province of Ilocos Sur, Baranas, *For. Bur. 14084 Merritt & Darling:* Province of Benguet, Baguio, *Elmer 8947* (type collection): Province of Union, Bauang, *Elmer 5631:* Province of Zambales, Subig, *Hallier s. n.:* Province of Tarlac, Concepcion, *Merrill 3633:* Province of Bataan, Dinalupijan, *Merrill 1581.*

N.v. *Pidpid*, Il.: *Butpat*, Ig., Benguet: *Cacadli*, Tag., Bataan.

21. **Glochidion camiguinense** Merr. in Philip. Jour. Sci. 3 (1908) Bot. 414. BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 4026, 4108 Fénix.*

22. **Glochidion merrillii** sp. nov. § *Hemiglochidion.*

Floribus axillaribus, fasciculatis, breviter pedicellatis; masculini perianthii segmentis 6, biseriatis, circiter 2 mm longis, ovalis vel ovatis,

antheris 3: perianthii feminei segmentis 6, brevioribus, ovario glabro, columna stylari ovario angustiore sed longiore, cylindracea; capsulis 7- vel 8-locularibus: foliis ellipticis vel lanceolatis, saepe falcatis, basi acutis, apice acuminatis.

Fascicles axillary, few-flowered, the sexes together or separate, the male flowers on pedicels attaining a length of 5 mm, perianth-segments 6, biseriate, the outer ovate or oval, exceeding 2 mm in length, the apex rounded or shortly acuminate, the inner shorter and narrower, usually conspicuously clawed at the base; anthers 3, 1.3 mm long, including the very shortly produced connectives: female flowers on shorter pedicels or subsessile, the perianth-segments shorter than in the male, lanceolate or ovate, the apex acuminate; ovary depressed-globose, nearly 1 mm in diameter, stylar column about one and a half times as long as the ovary but narrower, cylindric, deeply concave at the apex: capsules 7- or 8-celled, 1.5 cm in diameter and about half that length, the thin valves widely spreading on dehiscence, the apex slightly umbilicate.

A small tree or shrub, glabrous throughout, attaining a height of 7.5 m, its branches somewhat angled, covered with gray striate lenticellate bark: leaves borne on petioles 3 mm long, the lamina chartaceous, lanceolate or elliptic, often somewhat falcate, 5–9 cm long, 2–4.2 cm wide, the base usually strongly inequilateral, acute, the apex acuminate; primary lateral veins on each side of the midrib 7–9; stipules lanceolate to ovate, withering persistent, 1.5–2.5 mm long, acuminate.

LUZON, Province of Benguet, Mount Tonglon (Santo Tomas), *Williams 1356* (type); Pauai to Baguio, *Merrill 4804*.

23. **Glochidion rubrum** Bl. Bijdr. (1825) 586.

Phyllanthus diversifolius Miq. Fl. Ind. Bat. Suppl. (1861) 448.

Glochidion diversifolium Merr. in For. Bur. Bull. (Philip.) 1 (1905) 29.

LUZON, Province of Ilocos Norte (also given as Province of Albay), *Cuming 1194;* Pasuquin, *For. Bur. 13818 Merritt & Darling:* Province of Benguet, Twin Peaks, *Elmer 6364:* Province of Zambales, Rio Baquilis, *For. Bur. 6998 Curran;* Subig, *Hallier s. n., For. Bur. 374 Maule, Merrill 2106:* Province of Bataan, Mount Mariveles, Lamao River, *Whitford 1276:* Province of Rizal, Bosoboso, *Merrill 1870;* Malapadnabato, *Merrill 2747:* Province of Tayabas, Pagbilao, *Merrill 2425.* TICAO, Pandan, *For. Bur. 2535 Clark.* BOHOL, Guindulman, *Bur. Sci. 1240 McGregor.* MINDORO, Mangarin, *For. Bur. 9803 Merritt.* MINDANAO, District of Zamboanga, Lunsugan, *Ahern 611, 616.*

N. v. *Carmay, Gagang baquiro,* Tag., Zambales; *Dampol,* Tag., Tayabas; *Malacapi,* Tag., Rizal; *Malatumbaga,* Tag., Bataan; *Bugná,* Vis., Ticao.

Malaysia.

24. **Glochidion malindangense** Merr. sp. nov. § *Hemiglochidion.*

Frutex, ramulis pubescentibus: inflorescentiis pedunculatis; floribus masculinis mediocriter pedicellatis, pubescentibus, perianthii segmentis 6, lanceolatis, 1.5 mm longis, antheris 3; floribus femineis brevissime pedicellatis, pubescentibus, perianthii segmentis 6, lineari-lanceolatis, 4 mm longis, ovario dense hirsuto, 4- vel 5-loculari, columna stylari subcylin-

dracea, ovarium longitudine aequante sed angustiore, apice 8- vel 10-lobata; capsulis circiter 1 cm diametro: foliis lanceolatis vel ellipticis, apice gradatim acuminatis.

Inflorescence nearly always borne on short pubescent peduncles, the male flowers on pedicels 4–7 mm long, the female nearly sessile, rarely the male flowers racemed on the lower part of the peduncle and the female forming glomerules above: perianth-segments of the male flowers 6, lanceolate, 1.5 mm long, hirsute without, obtuse; anthers 3, the connective produced: perianth-segments of the female flowers conspicuously longer than those of the male, usually 4 mm, hirsute on both surfaces, lanceolate, subacute; ovary densely pubescent, 1–2 mm in diameter, 4- or 5-sulcate; stylar column about as long as the ovary, but narrower, short cylindric, the basal half hirsute, the upper glabrous and therefore appearing narrower, 8- or 10-lobed: capsules about 1 cm in diameter, depressed-globose and at the apex somewhat umbilicate, slightly pubescent, 4- or 5-celled, only one ovule usually maturing, the seeds 3.5 mm long.

A shrub 2 m high, its branchlets terete or slightly angled, densely pubescent or the older glabrescent; leaves borne on petioles 2 mm long, the lamina chartaceous, lanceolate or elliptic, 2.5–8 cm long, 1.5–3 cm wide, at the acute or obtuse base somewhat inequilateral, the apex gradually acuminate, mucronate, the upper surface more or less puberulent, the lower lepidote, and on the veins hirsute; stipules 2 mm long, lanceolate, acute, pubescent.

MINDANAO, Province of Misamis, Mount Libo near Mount Malindang, at an elevation of 1,650 m, *For. Bur. 4696 Mearns & Hutchinson.*

25. **Glochidion curranii** sp. nov. § *Hemiglochidion.*

Arbor vel arbuscula, floribus axillaribus, pedicellatis, femineis brevissime: floribus masculinis perianthio 6-partito, segmentis ovalibus, exterioribus 3 mm longis, interioribus 1.5 mm longis; antheris 3: floribus femineis perianthio 6-partito; ovario depresso-globoso, dense pubescente, columna stylari cylindracea, 0.5–0.8 mm longa, capsulis depresso-globosis, minute pubescentibus, 12–14 mm diametro: foliis petiolis 4–5 mm longis suffultis, laminis coriaceis, glabris, ellipticis, ovalibus, ovatis, vel subrotundis, basi decurrentibus, apice obtuse acuminatis.

Flowers of both sexes in axillary fascicles: male flowers borne on pedicels attaining 7 mm in length; the perianth 6-parted, in 2 series, the segments oval, those of the outer series 3 mm long, those of the inner 1.5 mm long, the latter hooded when young; anthers 3, 1 mm long, the connective distinctly produced: pedicels of female flowers very short but stout, perianth 6-parted but not as deeply as in the male, 2–3 mm long, the inner segments somewhat shorter than those of the outer row, broadly ovate, at the apex obtusely acuminate; ovary depressed-globose, densely pubescent, 1 mm long, 1.5 mm in diameter; the stylar column 0.5–0.8 mm long, cylindric, 6-lobed, the lobes emarginate: capsules depressed-

globose, light-brown, 5 mm long, 12–14 mm in diameter, minutely pubescent, 12-grooved, 6-celled; seeds 4–5 mm long.

A tree or bush attaining 10 m in height, the branchlets covered with grayish or brownish, striate, lenticellate bark, the ultimate branchlets usually strongly angled; glabrous or nearly so except the pedicels, perianth, and ovary: leaves borne on petioles 4–5 mm long, the lamina coriaceous, oval, elliptic, ovate, or nearly round, 6–12 cm long, 3–5 cm wide, the base acuminate and narrowly winging the petioles sometimes to their insertions, the apices obtusely acuminate; pairs of lateral veins on each side of the midrib 6–9.

Similar in general appearance to *G. rubrum*, most easily distinguished by the larger flowers.

PALAWAN, Puerto Princesa and vicinity, *For. Bur. 3502* (type) *Curran, 3474 Curran, Bur. Sci. 235 Mangubat;* Iwahig River, *Merrill 696, Bur. Sci. 783 Foxworthy;* Malatgao River, *Bur. Sci. 906 Foxworthy.*

26. **Glochidion philippicum** Benth. Fl. Hongkong. (1861) 314. (*G. philippinense.*)

Bradleia philippica Cav. Ic. 4 (1797) 48, *pl. 371.*

Bradleja philippensis Willd. Sp. Pl. 4 (1805) 592.

Gyrostemon blancoi Llanos Frag. Alg. Pl. Filip. (1851) 74.

Phyllanthus philippinensis Muell.-Arg. in Flora 48 (1865) 376.

LUZON, Province of Ilocos Norte, Bangui, *For. Bur. 13919 Merritt & Darling:* Province of Benguet, Twin Peaks, *Elmer 6366;* Sugpon, *For. Bur. 14115 Merritt & Darling:* Province of Nueva Vizcaya, Bambang, *For. Bur. 10885 Curran:* Province of Pangasinan, Villasis, *Alberto 42:* Province of Zambales, Aglao, *For. Bur. 6087 Aguilar;* Olangapo trail, *For. Bur. 5806 Curran;* between Castellejos and Aglao, *For. Bur. 5847 Curran:* Province of Bulacan, Angat, *For. Bur. 11192 Aguilar;* Norzagaray, *Yoder 66:* Province of Rizal, Bosoboso, *For. Bur. 10027 Curran;* Antipolo, *For. Bur. 405 Ahern's collector;* Montalban, *Bur. Sci. 5201 Ramos:* Province of Laguna, Calauan, *Cuming 459;* Los Baños, *Elmer s. n.:* Province of Tayabas, Atimonan, *Whitford 661:* Province of Camarines, Pasacao, *Ahern 160, 274.* MASBATE, Masbate, *Merrill 3069.* NEGROS, Province of Negros Occidental, Gimagaan River, *For. Bur. 4314 Everett;* Paglamgan River, *For. Bur. 4315 Everett.* MINDORO, Mompong, *For. Bur. 9691 Merritt;* Baco, *Merrill 1236;* Calapan, *Merrill 907;* Pola, *Merrill 2246;* Bongabong River, *For. Bur. 4076 Merritt, Whitford 1393;* Mansalay, *Merrill 910.* MINDANAO, Province of Surigao, Surigao, *Ahern 342:* District of Davao, Santa Cruz, *Williams 2707:* Lake Lanao, Camp Keithley, *Mrs. Clemens 470, 600, s. n.:* District of Cotabato, Malabang, *Mrs. Clemens s. n.:* District of Zamboanga, Sax River, *Williams 2348.* BASILAN, *Hallier s. n.*

In spite of its formation, it seems desirable to restore the original spelling of the specific name of this species, and it may fairly be credited to Bentham, who first made the necessary transfer, though with a changed ending.

The reduction of Llanos' species is made on his own authority, and his description makes it plausible. *Zarcoa philippensis* Llanos, reduced to this species by F.-Villar, certainly belongs elsewhere. Blanco appears not to have described it.

N. v. *Bagna,* Tag., Rizal; *Bugna,* Vis., Surigao; *Malaysa, Baringcocoron,* Zambales; *Matang hipon,* Tag., Rizal; *Calian, Antobanag,* Tag., Mindoro; *Yamog-yamog, Taquinis,* Vis., Negros.

Hongkong, Sumatra.

27. **Glochidion reticulatum** Elmer Leafl. Philip. Bot. 1 (1908) 302.

Frutex, ramulis teneris, striatis, plus minusve pubescentibus; floribus masculinis solitariis vel rarius binis, pedicellis circiter 1 cm longis gracilibus sparse pubescentibus suffultis; perianthii lobis 6, lanceolatis, breviter obtuse acuminatis, extus sparse hirsutis, margine membranaceis; antheris 3, 1 mm longis, connectivo conspicue protracto; floribus femineis et capsulis ignotis; foliis petiolis 1–2 mm longis suffultis, laminis ovatis vel ellipticis, 3–8.5 cm longis, 2–4 cm latis, aequilateralibus vel subaequilateralibus, basi rotundatis vel breviter acuminatis, apice plus minusve abrupte acuminatis; venis utrinque 6–8, subtus conspicuis; stipulis lanceolatis plus quam 1 mm longis.

Luzon, Province of Laguna, Los Baños, *Elmer 8188, Alberto s. n.*

7. BREYNIA Forst.

Calyx not or very slightly increasing in fruit.
Leaves elliptic or oval, rounded at the apex, 4- or 5-veined..... 1. *B. rhamnoides*
Leaves ovate, acuminate, 6- or 7-veined..... 2. *B. acuminata*
Calyx distinctly increasing in fruit..... 3. *B. cernua*

1. **Breynia rhamnoides** Muell.-Arg. in DC. Prodr. 15 [2] (1866) 440.
Phyllanthus rhamnoides Retz. Obs. Bot. 5 (1791) 30.

Luzon, Province of Bulacan, Malinta, *Bur. Sci. 6114 Robinson & Merritt:* Province of Rizal, Manila, *Loher 4737:* Province of Bataan, Mount Mariveles, Lamao River, *Williams 187, For. Bur. 1600 Borden:* Province of Batangas, Masambong, *Marave 90.* Apo Island, Mindoro Strait, *Merrill 430.* Negros, Province of Occidental Negros, Gimagaan River, *For. Bur. 4198 Everett.* Cebu, Toledo, *Bur. Sci. 1707 McGregor.* Mindanao, District of Davao, Davao, *Copeland 412, DeVore & Hoover 107.* Basilan, Santa Isabela, *DeVore & Hoover 62.*

N. v. *Tulugtulug,* Vis., Negros; *Sauting,* Moro, Basilan.

Tropical India, China, and Malaysia.

2. **Breynia acuminata** Muell.-Arg. in DC. Prodr. 15 [2] (1866) 442.
Melanthesa acuminata Muell.-Arg. in Linnaea 32 (1863) 74.

Luzon, Province of Ilocos Norte, Laoag, *For. Bur. 13803 Merritt & Darling;* Badoc, *For. Bur. 13933 Merritt & Darling:* Province of Ilocos Sur, Mount Bulagao, *For. Bur. 14062 Merritt & Darling;* Santiago, *For. Bur. 14068, 15651 Merritt & Darling:* Province of Benguet, Twin Peaks, *Elmer 6422, 6343:* Province of Zambales, Mount Iba, *Bur. Sci. 4797 Ramos;* Subig, *Hallier s. n.:* Province of Bataan, Mount Mariveles, Lamao River, *Elmer 6753, Williams 77, Whitford 399, For. Bur. 1495 Ahern's collector, For. Bur. 2189, 3009 Meyer, For. Bur. 10797 Curran, Leiberg 6107;* Cabcaben, *For. Bur. 5301 Curran;* Dinalupijan, *Merrill 1529.* Mindoro, *Cuming 1543* (type collection); Malatero, *For. Bur. 8559 Merritt;* Mount Teluto, *For. Bur. 11432 Merritt.*

N. v. *Malabalimbing, Lanuti,* Tag., Bataan; *Botonbotones,* Mindoro.

Endemic.

3. **Breynia cernua** Muell.-Arg. in DC. Prodr. **15**[2] (1866) 439.

? Phyllanthus cernuus Poir. Encycl. **5** (1804) 298.

Melanthesa cernua Decne. in Nouv. Ann. Mus. **3** (1834) 483.

B. cernua acutifolia Muell.-Arg. *loc. cit.*

Melanthesa cernua acutifolia Muell.-Arg. in Linnaea **32** (1863) 74.

Phyllanthus reticulatus Merr. in For. Bur. Bull. (Philip.) **1** (1903) 29, non Poir. Encycl. **5** (1804) 298.

BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 3997 Fénix.* BATANES ISLANDS, Batan Island, Santo Domingo de Basco, *Bur. Sci. 3718 Fénix.* LUZON, Province of Union, Bauang, *Elmer 5587:* Province of Benguet, Pauai, *Bur. Sci. 4421 Mearns;* Baguio, *Elmer 5957, Williams 1058;* Cayapa, *For. Bur. 10886 Curran;* Loakan, *For. Bur. 932 Barnes;* Itogon, *Bur. Sci. 5756 Ramos:* Province of Zambales, Botolan, *Merrill 2918;* Subig, *Hallier s. n.:* Province of Bataan, Mount Mariveles, Lamao River, *Whitford 391, For. Bur. 1357 Borden, Topping 534;* Olangapo trail, *For. Bur. 5809 Curran:* Province of Isabela, *Merrill 1114:* Province of Laguna, Calauan, *Cuming 540;* Los Baños, *Elmer s. n.:* Province of Tayabas, Sariaya, *Whitford 565;* Lucena, *Merrill 2886, Bur. Sci. 2365 Mearns;* Atimonan, *Gregory 124;* San Isidro, *For. Bur. 6595 Kobbé;* Malicboi, *Ritchie 36n:* Province of Camarines, Pasacao, *Ahern 197, 803 bis:* Province of Sorsogon, Sorsogon, *For. Bur. 10529 Curran:* without definite locality, *Cuming 1103.* MINDORO, Baco River, *McGregor 262, Merrill 1198;* Balete, *For. Bur. 5398 Merritt;* Bongabong River, *For. Bur. 3633 Merritt.* PANAY, Iloilo, *Copeland 126.* NEGROS, Province of Occidental Negros, Gimagaan River, *Whitford 1631.* CULION, Halsey Harbor, *Merrill 511.* PALAWAN, Puerto Princesa, *Bur. Sci. 237 Bermejos;* Iwahig, *Bur. Sci. 811 Foxworthy.* MINDANAO, District of Davao, Santa Cruz, *Williams 2688:* Lake Lanao, Camp Keithley, *Mrs. Clemens 181, 416 bis, s. n.:* District of Zamboanga, Sax River, *Williams 2149;* Tetuan, *Ahern 560.* BASILAN, *Hallier s. n.*

This species is with difficulty distinguished from *B. rhamnoides* except by the calyx, and specimens without mature fruit are best told by the leaves, which are nearly always ovate in the present species, but elliptic, oblong, or oval in *B. rhamnoides.*

Timor to northern Australia.

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THE PHILIPPINE

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C. BOTANY

VOL. IV JUNE, 1909 No. 2

ADDITIONAL PHILIPPINE SYMPLOCACEÆ, I.

By A. BRAND.

(*Frankfurt a. d. Oder, Germany.*)

Among the *Symplocos* material collected in the Philippines during the years 1907 and 1908, submitted to me by Mr. E. D. Merrill for identification, I have found no less than five new species and one new variety, so that the number of Philippine species of the genus known to me has now been increased to twenty-one.[1] Two of the species previously described, *S. floridissima* and *S. Cumingiana,* have been rediscovered for the first time by the American botanists. The new species all belong to the section *Bobua,* and accordingly the key to the species given in my previous paper [2] must be changed as follows:

1. Inflorescentiae compositae.
   2. Folia ramis adpressa, imbricata ..... 3. *S. imbricata*
   2. Folia patentia, haud imbricata.
      3. Corolla extus sericea.
         4. Stamina ca. 100; folia basi valde angustata ..... 4. *S. patens*
         4. Stamina ca. 60; folia basi plerumque rotundata ..... 5. *S. floridissima*
      3. Corolla extus glabra.
         4. Stamina ca. 100 ..... 6. *S. polyandra*
         4. Stamina 25–50.
            5. Inflorescentiae glabrae ..... 7. *S. Hutchinsonii*
            5. Inflorescentiae pilosae.
               6. Fructus globosus.
                  7. Inflorescentiae axillares ..... 8. *S. ferruginea*
                  7. Inflorescentiae terminales ..... 9. *S. Ahernii*
               6. Fructus ellipsoideus ..... 10. *S. adenophylla*

[1] Three species, *Symplocos fragrans, S. curtiflora,* and *S. angularis,* recently described by Mr. Elmer in his Leaflets of Philippine Botany, **2** (1908) 508–510, are at present known to me only by description.

[2] *This Journal,* **3** (1908) *Botany* 4.

1. Inflorescentiae simplices.
   2. Flores sub foliis prominentes ..... 11. *S. oblongifolia*
   2. Flores in axillis foliorum.
      3. Inflorescentiae terminales ..... 12. *S. imperialis*
      3. Inflorescentiae axillares.
         4. Ramuli glabri.
            5. Folia chartacea ..... 13. *S. betula*
            5. Folia coriacea.
               6. Flores racemosi ..... 14. *S. peninsularis*
               6. Flores spicati.
                  7. Folia 6–11 cm longa ..... 15. *S. Cumingiana*
                  7. Folia 3–5.5 cm longa ..... 16. *S. Whitfordii*
         4. Ramuli ferruginei vel pilosi.
            5. Fructus inconspicuus, vix 2.5 mm in diametro ..... 17. *S. inconspicua*
            5. Fructus 4–5 mm longus.
               6. Folia pleraque plus quam 4 cm longa.
                  7. Folia coriacea ..... 18. *S. luzoniensis*
                  7. Folia chartacea ..... 19. *S. Merrilliana*
               6. Folia pleraque minus quam 4 cm longa.
                  7. Folia utrinque glaberrima ..... 20. *S. palawanensis*
                  7. Folia plus minus pilosa ..... 21. *S. depauperata*

3. **S. imbricata** Brand sp. nov.

Arbor ramulis purpureis vel atro-purpureis, glabris. Folia crasse coriacea, ramulis adpressa et imbricata, 5–6 cm longa, 2.5–4 cm lata, ovata vel late ovata, serrato-dentata, utrinque glaberrima, in apicem brevem subito producta, basi leviter cuneata vel truncata, costa supra impressa; petiolus 5–10 mm longus. Spicae terminales et subterminales, compositae, glabriusculae, laxiflorae, petiolo multo longiores, fructiferae incrassatae et elongatae; bracteae 3, ovato-rotundatae, sericeae, calycem occultantes; calycis tubus brevissimus, glaber, lobi rotundati, obtusi, sericei, tubo multo longiores, post defloration em supra ovarium glabrum convergentes; stylus glaber, calyce duplo longior; corolla mihi non visa. Fructus niger, ovato-ampulliformis, 10–12 mm longus, valde rugosus, glaber, trilocularis, sed loculis binis plus minus abortientibus; lobi calycini discum comose superantes.

LUZON, Province of Zambales, Mount Tapulao, *Bur. Sci. 4701 Ramos*, December, 1907: Province of Benguet, Pauai, *Bur. Sci. 4476 Mearns*, August, 1907, with mature fruit, altitude 2,200 m.

5. **S. floridissima** Brand in Pflanzenreich 6 (1901) 35, var. **serrata** var. nov.

Arbor ramulis atro-purpureis glabris. Folia tenuiter coriacea, 10–13 cm longa, 4–7 cm lata, ovalia vel elliptica, grosse serrata, utrinque glabra, in apicem brevem subito producta, basi nunc rotundata, nunc cuneata; petiolus ca. 2 cm longus. Paniculae puberulae, petiolo 4–6-plo longiores, pedicellis calycem aequantibus vel superantibus; bracteae minimae; calyx dense ferrugineus, lobis rotundato-triangularibus tubum aequantibus; corolla calyce duplo longior, 5-partita, extus sericea; stamina

ca. 60; stylus glaber, calyce triplo longior; ovarium dense sericeum. Fructus mihi non visus.

LUZON, Province of Bulacan, Angat, *For. Bur. 11147 Aguilar*, March, April, 1908.

This variety is an intermediate form connecting *Symplocos patens* and *S. floridissima*.

6. **S. polyandra** Brand in Pflanzenreich **6** (1901) 36.

Additional material: LUZON, Province of Rizal, *Bur. Sci. 2181 Ramos*, March, 1907.

7. **Symplocos Hutchinsonii** Brand sp. nov.

Arbor 6 m alta, ramulis glabris, atro-purpureis, rugoso-striatis, nitentibus. Folia chartacea, 7–9 cm longa, 3–4 cm lata, elliptica, repando-serrata, utrinque glaberrima et opaca, supra (in sicco) atrato-, subtus incano-viridia, breviter et obtuse apiculata, basi cuneata, costa supra impressa; petiolus 10–14 mm longus, saepe curvatus. Paniculae glabrae, divaricatae, petiolo ca. 6-plo longiores, terminales et subterminales, pedicellis calycem subaequantibus; calyx glaber, lobis ovalibus, flavescentibus, tubo duplo longioribus; corolla glabra, 5-partita, calyce duplo longior; stamina ca. 50; stylus glaber, calyce subduplo longior; ovarium glabrum. Fructus mihi non visus.

MINDANAO, District of Zamboanga, *For. Bur. 6551 Hutchinson*, March, 1907, altitude about 5 m above sea level.

8. **S. ferruginea** Roxb. var. **philippinensis** Brand in Philip. Journ. Sci. **3** (1908) Bot. 6.

Additional material: LUZON, Province of Laguna, *For. Bur. 10167 Curran*, March, 1908.

9. **S. Ahernii** Brand l. c.

Additional material: LUZON, Province of Benguet, *Bur. Sci. 3442 Mearns*, July, 1907. MINDORO, Mount Malasumbu, *For. Bur. 8590 Merritt*, January, 1908.

11. **S. oblongifolia** (C. Presl) Rolfe in Journ. Bot. **23** (1885) 214.

Additional material: LUZON, Province of Pangasinan, *For. Bur. 8340 Curran & Merritt*, December, 1907.

12. **Symplocos imperialis** Brand sp. nov.

Arbor, ramulis glabris, purpureo-brunneis, rugoso-striatis. Folia ad apices ramulorum comose congesta, tenuiter coriacea, 5–7 cm longa, 2–3 cm lata, oblongo-elliptica, leviter serrulato-undulata, utrinque glaberrima et (in sicco) viridia, in apicem longiusculum subito producta, basi cuneata, costa supra leviter impressa; petiolus recurvatus, 15–20 mm longus, colore ramulorum. Flores mihi non visi. Inflorescentiae fructiferae terminales, congestae, glabrae, petiolo 3–4-plo longiores, pedicellis fructu brevioribus. Fructus laete brunneus, ovoideus, glaber, ca. 7 mm longus, trilocularis, lobis calycinis brevibus, rotundato-triangularibus, parce sericeis coronatus.

BABUYANES ISLANDS, Camiguin, *Bur. Sci. 4133 Fénix*, June–July, 1907.

14. **Symplocos peninsularis** Brand sp. nov.

Arbor, ramulis glabris, purpureo-brunneis, angulatis, striatis. Folia juniora chartacea, vetustiora coriacea, 6–7 cm longa, 3–4 cm lata, obovata, crenato-serrata, utrinque glaberrima, supra in sicco atro-viridia et (vetustiora) nitentia, subtus viridia vel albida, opaca, breviter apiculata, subito in petiolum contracta; costa supra impressa; petiolus subalatus, 6–10 mm longus, colore ferrugineo. Flores mihi non visi. Inflorescentiae fructiferae axillares, petiolo 2–3-plo longiores, fructus paucos gerentes; pedicelli fructibus longiores. Fructus dilute brunneus, ovoideo-globosus, glaber, ca. 7 mm longus, trilocularis, lobis calycinis rotundatis glabris comose coronatus.

MINDANAO, District of Zamboanga, *For. Bur. 9188 Whitford & Hutchinson*, January, 1908, in dipterocarp forests at 50 m above sea level.

15. **S. Cumingiana** Brand in Pflanzenreich **6** (1901) 58.

A tree 5 m high and not uncommon in Luzon, now rediscovered by the American botanists for the first time on Mount Tapulao, Province of Zambales, Luzon, *For. Bur. 8254 Curran & Merritt*, December, 1907, altitude 1,500 m.

16. **S. Whitfordii** Brand in Philip. Journ. Sci. **3** (1908) Bot. 8.

Additional material: LUZON, Province of Laguna, Mount Banajao, *Bur. Sci. 6067 Robinson*, March, 1908; *For. Bur. 7890 Curran & Merritt*, November, 1907, altitude 2,250 m.

17. **Symplocos inconspicua** Brand sp. nov.

Frutex 4 m alta, ramis atratis, glabris, ramulis ad basin sordide-, ad apicem ferrugineo-hirsutis. Folia chartacea (vetustissima tenuiter coriacea), 5–7 cm longa, 1.5–2.5 cm lata, oblongo-elliptica, serrato-dentata, supra glabra, subtus ad costam pilosa, utrinque (in sicco) viridia, in apicem mucronatum sensim producta, basi subrotundata vel leviter cuneata; costa supra impressa; petiolus 2–3 mm longus, ferrugineo-hirsutus. Spicae axillares, breves, simplices, petiolo ca. 5-plo longiores, aureo-sericae, ca. 7-florae; bracteae rotundato-acutae, sericeae; calyx glaber, lobis rotundatis, glabris, flavidis, tubum aequantibus; corolla glabra, calyce plus duplo longior, 5-partita; stamina 20 (ex unico flore), corollam aequantia vel vix superantia; ovarium circum styli basin sericeum, stylus inferne parce sericeus, superne glaber, calyce plus duplo longior. Fructus inconspicuus, vix 2.5 mm in diametro, globosus, glaber, viridi-brunneus, abortu unilocularis, monospermus, bracteis persistentibus suffultus, lobis calycinis pro fructu magnis comose coronatus.

LUZON, Province of Zambales, Mount Tapulao, *Bur. Sci. 5022 Ramos*, December, 1907 (type); same locality, *For. Bur. 8093 Curran & Merritt*, December, 1907, altitude 1,400 to 1,700 m.

19. **S. Merrilliana** Brand in Philip. Journ. Sci. **3** (1908) Bot. 9.

Additional material: LUZON, Province of Laguna, Mount Banajao, *Bur. Sci. 6081 Robinson*, March, 1908; *For. Bur. 7867 Curran & Merritt*, November, 1907. The color of the ripe fruit in the latter specimen is black, not "brunneo-flavescens;" the black exocarp is so deciduous that it is rarely preserved in dried specimens.

NEW OR INTERESTING PHILIPPINE FERNS, IV.

By Edwin Bingham Copeland.

(*From the Bureau of Education, Manila, P. I.*)

CYATHEA Smith.

Cyathea philippinensis Baker, var. **nuda** var. nov.

Costis plerisque glaberrimis, aliis rhachin versus paleis sparsis vestitis, rhachibus omnibus infra mox glabrescentibus.

Luzon, Province of Benguet, Mount Atip, *For. Bur. 10859 Curran, For. Bur. 18017 Merritt*, altitude 1,400 m.

PERANEMA Don.

Peranema luzonica sp. nov.

Stipite circiter 30 cm alto, ubique sat dense pedem versus densissime paleaceo, paleis brunneis diversis, majoribus lanceolato-ovatis valde apiculatis, 3 mm latis; fronde usque ad 60 cm alta, anguste deltoidea, quadripinnatifida, rhachibus omnibus paleaceis; pinnulis [i] stipitatis, oblongo-lanceolatis, obtusis, usque ad 7 cm longis; pinnulis [ii] majoribus brevistipitatis 13 mm longis, obtusis, oblongis, fere ad costam pinnatifidis, coriaceis, pubescentibus; soris brevipedicellatis, 1.2–1.5 mm latis, saepius oblatis, indusiis glaucis, irregulariter fissis; cellulis annuli 16–19; sporis tuberculatis.

Luzon, Province of Benguet, Mount Pulog, *For. Bur. 16280 Curran, Merritt, & Zschokke*, from an altitude of 2,500 m to the summit, *Copeland.*

Very near the Indian species, *P. cyatheoides* Don, but differing from that as described and figured, in the broader paleæ, more dissected frond, and nowhere glabrous pinnules, and the sori much larger in proportion to the fertile pinnæ. Specimens from western China, *leg. Wilson 5374* are referable to the Indian species.

DRYOPTERIS Adanson.

Dryopteris tenerrima sp. nov.

Rhizomate erecto, circiter 7 mm crasso; stipitibus circiter 20 cm altis, confertis, ad baseos in vivo incrassatis, succulentibus, siccis gracilibus, nigricantibus, apud baseos squamulis parvis laete brunneis ciliatis ornatis, tota planta aliter glabra; fronde usque ad 25 cm alta, 15 cm lata, subdeltoidea, tripinnatifida; pinnis inferioribus brevissime stipitatis, acuminatis; pinnulis sessilibus, plerisque obtusis, pinnae infimae basiscopicis majoribus,

ad alam angustam pinnatifidis; segmentis oblongis, inciso-serratis, obtusis, tenuiter membranaceis, atroviridibus (siccis); venulis simplicibus; soris medialibus, parvis, nudis, subglobosis; cellulis annuli 10–12.

LUZON, Province of Laguna, Mount Banajao, *Copeland 2142*, in a very damp gorge at an altitude of 1,600 m.

A species of unknown affinity. It has rather the aspect of *Athyrium;* but I do not know any species of that genus to which it seems to be very near, and so have been constrained by the form of the sori to describe it as *Dryopteris*. It suggests *Monachosorum* in the small sori, blackish dried fronds, and swollen succulent bases of the stipes. It is more primitive and generalized than any other fern, known to me, with naked sori.

ATHYRIUM Roth.

Athyrium macrocarpum (Bl.) Bedd. Ferns South. Ind. (1863) *t. 152, 153.*

A. halconense Christ in Philip. Journ. Sci. Bot. 3 (1908) 273.

LUZON, Province of Laguna, Mount Banajao, *Copeland 2120*, altitude 2,200 m.

The plant called *Athyrium halconense* is a form with exceptionally uniform and entire pinnæ. Although recognizing its affinity[1] I did not doubt its distinctness until I collected on Mount Banajao specimens bearing on the same stem fronds of typical *A. macrocarpum*, and less adult, but fertile ones, referable to *A. halconense*, and found with these, less adult plants altogether identical with typical *A. halconense*. Typical *A. macrocarpum* has also come in from Mount Pulog, Province of Benguet, Luzon, *For. Bur. 16276 Curran, Merritt, & Zschokke. Athyrium anisopteron* Christ is very near this, but is, up to the present time, recognizable by its crowded sori.

CURRANIA genus novum.

Rhizomate late repente, palearum cellularum lumine fusco; stipitibus non articulatis; fronde deltoidea, pinnatifida, glabra; venulae infimae acroscopicae ramis saepe anastomosantibus; soris dorsalibus elongatis, nudis, paraphysibus carentibus.

Currania gracilipes sp. nov.

Rhizomate 1 mm crasso, versus apicem paleis sordidis 1.5 mm longis lanceolato-ovatis vestito; stipitibus viridibus stramineisque, filiformibus, usque ad 20 cm altis, glabris; fronde 5–9 cm alta, 3–5.5 cm lata, cordata, ad alam 4 mm latam pinnatifida; segmentis late oblongis, infimis falcatis, aliis rectis, obtusis, serratis, siccis papyraceis, utrinque viridibus; venulis furcatis, ramo inferiore saepius iterum furcato, liberis vel ramis 2 venulae infimae acroscopicae sursum coadunatis; soris utroque latere uni- vel biseriatis, oblongis vel linearibus, 1–3 mm longis.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16302 Curran, Merritt, & Zschokke,* in rock-crevices of open grass land, altitude 2,900 m, *Copeland P. P. E. 112;* Pauai, alt. 2,300 m, *Copeland.*

This fern is in all probability derived from *Athyrium.* The paleæ have reasonably thin cell-walls and dark contents. The epidermal cells of the frond

[1] *This Journal, Botany* 3 (1908) 291.

are very sinuous in outline, as in "*Diplazium.*" In outline of frond *Athyrium crenato-serratum* suggests *Currania,* but no near relative of the former has simple fronds. I have included in *Athyrium* several species with naked sori, but in these cases the intermediate relationships were quite clear. *Currania,* beside having no indusia, is so distinct in aspect and in various characters from any group in *Athyrium* that its generic separation seems necessary. Fresh fronds have a fine odor of cumarin.

ASPLENIUM Linn.

Asplenium epiphyticum Copel.

Luzon, Province of Laguna, Mount Maquiling, *Copeland,* altitude 500 m. Hitherto known only from Mindanao.

The spores are beset with long spine- or horn-like projections, usually curved, making them look like miniature burrs. The spores of *A. scolopendroides* J. Sm., and *A. trifoliatum* Copel., of Borneo, are similar. I have examined the spores of various species of *Stenochlaena,* to which genus Christ[2] would reduce *A. epiphyticum,* and have found nothing at all similar, although several species have rough spores. I also believe this fern and *Stenochlaena* to be related, and nearly so; but this is none the less an *Asplenium* for that reason.

Asplenium tenuifolium Don Prodr. Fl. Nepal. (1825) 8.

Luzon, Province of Benguet, exact locality not stated, *For. Bur. 15729 Merritt & Curran,* exactly like small specimens from Sikkim; Mt. Pulog, 2,300 m. alt., *Copeland.*

Hitherto known only from British India, including Burma.

Asplenium gracilifolium sp. nov.

Rhizomate breve, 1.5–2 mm crasso, paleis castaneis 2 mm longis angustis tenuissimis vestito; stipitibus confertis usque ad 10 cm longis, 0.8 mm crassis, castaneis, nitidis, primo paleis conformibus vestitis, glabrescentibus; fronde 15–25 cm alta, 2.5–3.5 cm lata, acuminata, bipinnata, rhachi deorsum castanea sursum alata et viridescente, interdum in alis pinnarum prolifera; pinnis stipitatis, ovatis, obtusis, glabris, herbaceis; pinnulis pinnarum maximarum acroscopicis 1–2, basiscopicis 1, flabellato-cuneatis, usque ad 8 mm longis et 6 mm latis, apice rotundatis, leviter inciso-crenatis, lobis obtusis; venatione laxa; soris brevibus, margine haud approximatis, indusiis latis, pallidis.

Luzon, Province of Laguna, Mount Banajao, *Copeland 2123,* epiphytic on mossy trunks, 1,700 to 2,250 m altitude.

This seems to be most nearly related to *Asplenium laserpitiifolium,* from which, and from the other allied species of the same difficult group, it differs in the very narrow fronds. *Asplenium Elmeri* is more finely cut, and has the ultimate divisions much narrower, with longer sori. *A. gracile* Fée, judging from a specimen of Cuming's, may be this species, although Fée's figure, of a presumably juvenile form, represents the sori as longer and the teeth as sharp; at any rate Fée's name is invalid. I have seen this fern only from Mount Banajao, but from this locality have twelve sheets of very uniform specimens.

[2] Biologishe und systematische Bedeutung des Dimorphisus und der Missbildung bei epiphytischen Farkräutern, besonders *Stenochlaena. Verhandl. Schw. Naturforsch. Gesellschaft* (1907).

PLAGIOGYRIA Mettenius.

Plagiogyria nana sp. nov.

Plagiogyria gregis P. glaucae Mett. qua statura reducta, pinnis rigidis confertis obtusis conspicue differt. Stipite frondis sterilis 3–5 cm alto, frondis fertilis circiter 15 cm, aerophoris paucis; fronde sterile 10–13 cm alta, 5–6 cm lata; pinnis approximatis vel infimis paullo remotis, fere omnibus liberis, sessilibus, circiter 6 mm latis, obtusis, minute serrulatis, rigide coriaceis, infra glaucis; fronde fertile circiter 10 cm alta, sat condensata, pinnis 25–35 mm longis, linearibus, falcatis.

Luzon, Province of Benguet, Mount Pulog, *For. Bur. 16306 Curran, Merritt, & Zschokke,* common in grass lands, altitude 2,850 m, *Copeland P. P. E. 113.*

This is conceivably a form of *P. glauca,* due to the very unusual environment, but is distinct in various respects beside the stature. Specimens growing in brush are of course decidedly less dwarfed, but they are still far from typical *P. glauca.*

POLYPODIUM Linn.

Polypodium subpinnatifidum Blume Enum. (1828) 129.

Luzon, Province of Benguet, Mount Pulog, *For. Bur. 16293 Curran, Merritt, & Zschokke,* mixed with plants of the mossy forest, altitude probably 2,800 m, *Copeland.*

The stipes are less hairy than figured by Blume, and in one specimen are 5 cm long, but the identification is unmistakable. The plant is already known from Java and Perak; new to the Philippines.

Polypodium subsecundo-dissectum Zoll. Syst. Verz. (1854) 38, 48.

P. gedeanum Racib. Pterid. Buit. (1898) 96.

Luzon, Province of Laguna, Mount Banajao, *Copeland 2136,* found once on a mossy trunk, altitude 2,250 m.

Known from Java and New Caledonia; new to the Philippines.

This has been described as a relative of *Polypodium minutum* and *P. subfalcatum.* It is really nearly related to *P. tenuisectum* Bl., and is a link, hitherto needed, between the few species with dissected fronds and the body of the genus. The stipes are not articulate.

Polypodium curranii sp. nov.

Species P. tenuilori Kze., et P. dolichoptero Copel. affinis, fronde pseudo-furcata; rhizomate 3 mm crasso, paleis atro-fuscis angustatis 3 mm longis vestito; stipite obscure articulato, nudo, circiter 1 cm alto vel usque ad furcam infimam frondis circiter 15 cm alto alato, ala sursum 2–3 mm lata; fronde furcato-pinnata, ramis paucis, ultimis 5–15 cm longis plus minus divergentibus 3–7 cm latis, acuminatis, omnino glabra, herbacea, venatione gracile, inconspicua; soris multis, irregularibus, saepius elongatis, minutis.

Luzon, Province of Benguet, Mosquito Creek, *For. Bur. 15728 Curran,* altitude 2,000 m.

This is decidedly more slender throughout than *Polypodium dolichopterum,* and the lateral segments are so strongly developed that the lower ones almost rival the main axis, and many fronds look monopodial rather than pinnatifid. *P. tenuilore* has a simple and entire frond, but is like this group in texture, venation, and sori.

PROSAPTIA Presl.

Prosaptia linearis Copel. sp. nov.

Species distinctissima; rhizomate subrepente, ad apicem paleis angustis cancellatis atro-fuscis ciliatis vestito; stipitibus confertis, exarticulatis, brevibus; fronde usque ad 40 cm longa, circiter 16 mm lata, pinnata, rhachi tenue, nigra, ubique glabra; pinnis late adnatis non confluentibus, acutis, integris, coriaceis, inferioribus sensim in dentes diminutis; soro in pinna quaque uno, costa orto, profunde immerso, apud vel ad marginem acroscopicum aperto, annulo inaequale ciliato circumdato.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16303 Curran, Merritt, & Zschokke*, on mossy trees, altitude 2,700 m, *Copeland*.

A bizarre fern, resembling *Loxoscaphe* in the appearance of the fruit. The solitary sori and the very narrow fronds strongly suggest *Acrosorus*, but the origin of the protection of the sorus is very essentially different. Small fronds are so similar to those of *Polypodium decorum* that I at first regarded it as derived from that species, and therefore to be treated as generically new, rather than included in *Prosaptia*. However the paleæ are like those of *Prosaptia*, while those of *Polypodium decorum* have thinner walls and are not ciliate.

The tip of the pinna is produced as a sharp point beyond the sorus, and bent toward the tip of the frond. As the fronds are pendent these tips serve to drain off water and protect the sori from wetting. The ecological significance of the movement of the sori to the margin, found independently in many groups of ferns, I have before interpreted; as also the value of the rim, and the circle of hairs around the sori.

A REVISION OF PHILIPPINE CONNARACEÆ.

By E. D. MERRILL.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

This family is a small one so far as the Philippine flora is concerned, but like most groups of plants found in the Archipelago, has long been in need of revision. Our herbarium contained numerous unclassified specimens, and there was considerable doubt as to the proper specific name to use in the case of several identified species. Blanco's imperfect descriptions have always been the cause of more or less doubt as to the identity of his species, and F.-Villar's erroneous identifications of these have added to the confusion. In the case of extant herbarium material, no less than three specific names have been published by as many different authors, all based on a single number of Cuming's Philippine collection, *No. 851,* while *Cuming 1172* has had two specific names applied to it.

Blanco described the first Philippine representatives of the family, five species, all of which he placed under the genus *Cnestis.* Two of them are properly referable to this genus, although reducible to a single species, but the other three are referable to *Connarus* and *Rourea.*

F.-Villar, in the Novissima Appendix to the third edition of Blanco's Flora de Filipinas, enumerates twelve species in four genera, but only five of these actually occur in the Philippines, so far as the study of material now available shows. Most of Blanco's species were erroneously reduced to species that do not extend to the Philippines.

In the present paper five genera and seventeen species are recognized as occurring in the Philippines, but the list of both genera and species will undoubtedly be considerably increased as botanical exploration of the Archipelago progresses. With the exception of two, or possibly three species, all of those enumerated below are endemic in the Philippines. There are apparently also two or three additional species of *Connarus,* probably undescribed, but so far represented in our herbarium by imperfect material, so that it is not deemed advisable to consider them at the present time.

Table of distribution of Indo-Malayan, Philippine and Chinese Connaraceæ.

Genera.	India.[1]	Malay Peninsula.[2]	Malay Archipelago.[3]	China.[4]	Philippines.
Agelaea	2	4	2	0	2
Connarus	13	9	17	0	10
Cnestis	1	1	1	0	1
Ellipanthus	5	5	2	0	2
Rourea	12	9	14	2	2
Roureopsis	1	2	1	0	0
Tæniochlaena	1	1	2	0	0
Troostwyckia	0	0	1	0	0
Total	35	31	40	2	17

KEY TO THE GENERA.

1. Pistils solitary; follicles with a distinct stipe.
   2. Leaves pinnate, the leaflets 3 to 7; scandent shrubs ..... 1. *Connarus*
   2. Leaflet solitary; small trees ..... 2. *Ellipanthus*
1. Pistils 2 to 7; follicles sessile.
   2. Pistils 5, but usually only 1 perfect; follicle not rugose; seeds exalbuminous; leaves pinnate ..... 3. *Rourea*
   2. Pistils 2 to 5, perfect; follicles rugose or tubercled; seeds exalbuminous; leaves trifoliolate ..... 4. *Agelaea*
   2. Pistils 5 to 7; follicles densely pubescent; seeds albuminous, the aril thin. 5. *Cnestis*

1. **CONNARUS** Linn.

1. Leaflets 3; follicles large, woody, horned ..... 1. *C. trifoliatus*
1. Leaflets usually more than three, or if three, the follicles coriaceous, not horned.
   2. Indumentum stellate-plumose ..... 2. *C. stellatus*
   2. Indumentum not stellate.
      3. Bracts and bracteoles linear-cyclindric, the former frequently 1 cm long and exceeding the flowers ..... 3. *C. bracteatus*
      3. Bracts and bracteoles not prominent.
         4. Leaflets glabrous; follicles small, coriaceous or subcoriaceous.
            5. Leaflets rounded, acute, or only broadly and obscurely acuminate, not prominently glandular-punctate beneath.
               6. Margins of the petals adherent above the ovary, forming a short tube above the inflated base; follicles glabrous inside. 4. *C. culionensis*
               6. Petals free throughout; follicles more or less pubescent inside.
                  7. Base of the leaflets broad, rounded or subcordate, the apex broad, rounded, entire ..... 5. *C. obtusifolius*
                  7. Base of the leaflets narrowed, acute or obtuse, the apex usually shortly and obscurely acuminate, slightly retuse. 6. *C. neurocalyx*
            5. Leaflets strongly acuminate, usually prominently glandular-punctate beneath.

[1] Hooker f. Fl. Brit. Ind. **2** (1876) 46–56.
[2] King in Journ. As. Soc. Beng. **66**[2] (1897) 1–21.
[3] Boerlage Handl. Fl. Ned. Ind. **1** (1890) 313–321.
[4] Forbes & Hemsl. in Journ. Linn. Soc. Bot. **23** (1886) 149–150.

6. Follicles subcylindric, usually straight, not or but slightly inflated, about 4 cm long..... 7. *C. hallieri*
6. Follicles inflated, 2.5 cm long or less.
7. Petals free throughout..... 8. *C. mindanaensis*
7. Petals free below, inflated, but above the ovary their margins adherent, forming a narrow short tube..... 9. *C. whitfordii*
4. Leaflets more or less ferruginous-pubescent beneath; follicles large, woody, 5 cm long..... 10. *C. subinaequifolius*

1. **Connarus trifoliatus** (Turcz.) Rolfe in Journ. Bot. 23 (1885) 212 (*trifoliolatus*); Vidal Rev. Pl. Vasc. Filip. (1886) 103; Ceron Cat. Pl. Herb. (Manila) (1892) 59.

Anisostemon trifoliatus Turcz. in Bull. Soc. Nat. Mosc. 20[1] (1847) 152.

Connarus polyanthus Planch. in Linnaea 23 (1850) 428; Miq. Fl. Ind. Bat. 1[2] (1859) 665; Walp. Ann. 2 (1851) 300.

Connarus rolfei Vidal Phan. Cuming. Philip. (1885) 106.

LUZON, Province of Albay, *Cuming 851*, type collection of *Anisostemon trifoliatus*, *Connarus polyanthus*, and *C. rolfei*. NEGROS, Gimugaan River, *For. Bur. 4299 Everett*. MINDANAO, Province of Surigao, *Bolster 316;* Lake Lanao, Camp Keithley, *Mrs. Clemens 332*.

This species has received three distinct specific names, all based on the same number of Cuming's Philippine collection, the oldest being *Anisostemon trifoliatus* Turcz., which is here retained. Vidal[5] erroneously refers to *Connarus polyanthus* Planch. *Cuming 1465*, and this species is so written up in the Kew Herbarium. The specimen is however not at all like Planchon's species, nor is it cited by that author.

Endemic.

2. **Connarus stellatus** sp. nov.

Frutex scandens, ramulis, foliis junioribus, paniculisque densissime pubescentia stellato-plumosa obtectis; foliis circiter 20 cm longis, impari-pinnatis, foliolis 7, lanceolatis, subcoriaceis, nitidis, basi acutis, apice acuminatis; paniculis terminalibus, folia aequantibus, pyramidatis; sepalis densissime stellato-tomentosis; petalis obtusis, plus minus punctatis, extus puberulis; staminibus 10, inaequalibus; carpellis dense pubescentibus; stylo 4 mm longo.

A scandent shrub, the young branches, leaves, and the inflorescence densely covered with brown-stellate-plumose indumentum, the leaflets ultimately glabrous or nearly so. Branches light-yellowish-gray, lenticellate, glabrous. Leaves about 20 cm long, the rachis and petiolules densely brown-stellate-plumose; leaflets 7, the lower ones alternate, the upper opposite, lanceolate, subcoriaceous, brown, shining, in age glabrous or nearly so, 6 to 10 cm long, 2 to 3 cm wide, base acute, apex slightly acuminate, acumen blunt; nerves 6 or 7 on each side of the midrib, not prominent, ascending, the reticulations rather close; petiolules 2 to 3 mm long. Panicle terminal, pyramidal, about as long as the leaves, very densely covered with brown stellate-tomentose indumentum. Sepals lanceolate, acuminate, about 3 mm long, densely stellate-pubescent. Petals

[5] Phan. Cuming. Philip. (1885) 106, Rev. Pl. Vasc. (1886) 103.

narrowly oblong, obtuse, about 5 mm long, 1.5 mm wide, glandular-punctate, puberulous on the back. Stamens 10, unequal, the longer 5 filaments puberulous, 2.5 mm long, the shorter 5 glabrous, 1 mm long. Carpel 1, obliquely ovoid, densely pubescent; style 4 mm long, slightly puberulent.

BALABAC, *Bur. Sci. 520 Mangubat*, March–April, 1906.

A species at once recognizable by its dense brown-stellate-plumose indumentum.

3. **Connarus bracteatus** sp. nov.

Frutex scandens, foliis junioribus paniculisque plus minus ferrugineo-tomentosis; foliis alternis, imparipinnatis, circiter 15 cm longis, foliolis 5 vel 7, oblongis, submembranaceis, breviter acuminatis; paniculis terminalibus, foliis multo longioribus, usque ad 40 cm longis, pubescentibus; floribus in ramulis densissime racemoso-dispositis; bracteis linearibus, usque ad 1 cm longis; petalis utrinque pubescentibus; staminibus 10, inaequalibus; carpellis densissime pubescentibus.

A scandent shrub, the young branches, leaves and the inflorescence more or less ferruginous-tomentose. Branches brown, somewhat lenticellate, terete. Leaves alternate, odd-pinnate, about 15 cm long; leaflets 5 or 7, oblong, 6 to 10 cm long, 2 to 3.5 cm wide, submembranaceous, slightly tomentose when young, base acute, apex shortly acuminate, shining, brown; nerves 5 or 6 on each side of the midrib, distinct, faintly anastomosing, the reticulations rather dense; petiolules densely pubescent, 5 to 8 mm long. Panicles terminal, very large, at least 40 cm long, ferruginous-pubescent, pyramidal, the lower branches sometimes 20 cm in length. Flowers densely racemosely disposed on the ultimate branchlets, each subtended by a narrow, linear, cylindric, pubescent bract, and by one or two similar but shorter bracteoles. Pedicels 2 to 3 mm long, the bracteoles 2, about the same length, the bracts frequently 1 cm in length and exceeding the flowers. Sepals ovate-lanceolate, acuminate, 3.5 to 4 mm long, glandular-punctate, densely pubescent outside, slightly so within. Petals oblong-lanceolate, obtuse, strongly glandular-punctate, slightly puberulent on both surfaces, 6 mm long, 2 mm wide. Stamens 10, unequal, the five longer filaments slightly glandular-puberulent, 3 mm long, the five shorter glabrous, 1 mm long. Carpel 1, ovoid, densely pubescent; style pubescent, 1.5 mm long. Follicle unknown.

LUZON, Province of Cagayan, San Vicente, *For. Bur. 11308 Klemme*, April, 1908, in dense level forests at about 5 m altitude.

A species at once recognizable by its large panicles and prominent bracts and bracteoles. Allied to *Connarus neurocalyx* Planch.

4. **Connarus culionensis** sp. nov.

Frutex erectus vel scandens, ramulis, petiolis, paniculisque densissime ferrugineo-tomentosis; foliis brevibus, circiter 10 cm longis, imparipinnatis, foliolis 5 vel 7, oblongis, subcoriaceis, acutis vel obscure acuminatis;

paniculis terminalibus, diffusis, 20 cm longis; sepalis coriaceis, carinatis; petalis supra glanduloso-punctatis, extus pubescentibus, basi angustatis; staminibus 10, inaequalibus; carpellis globosis, dense pubescentibus; folliculis 2.5 cm longis, compressis, apice rotundatis, extus pubescentibus striatisque, intus glabris.

An erect, or in favorable habitat probably a scandent shrub. Branches brown, terete, glabrous or nearly so, the young branchlets very densely ferruginous-tomentose. Leaves alternate, about 10 cm long, the petiole, rachis and petiolules densely ferruginous-tomentose; leaflets 5 or 7, oblong, subcoriaceous, brown, shining, glabrous, or when young with few hairs, especially at the base, 4 to 7 cm long, 1 to 2.5 cm wide, base usually rounded, apex acute or obscurely acuminate; nerves about 5 on each side of the midrib, curved-ascending, anastomosing, distinct, the reticulations lax; petiolules about 2 mm long. Panicles terminal, ample, pyramidal, 20 cm long, densely ferruginous-tomentose. Sepals coriaceous, 3.5 mm long, 1.5 mm wide, densely pubescent, keeled, the margins thinner than the median portion. Petals 7 mm long, 1 mm wide, densely pubescent outside in the upper portion and glandular-punctate, base narrowed, the lower portions free, but above the ovary adherent, forming a narrow tube, the upper portion entirely free. Stamens 10, unequal, the longer five glandular-puberulous, 4 to 4.5 mm long, the shorter five glabrous, 1.2 mm long. Carpel 1, globose, densely pubescent; style 2 mm long, somewhat pubescent. Follicle oblong-ovoid, 2.5 cm long, somewhat compressed, apex rounded, base narrowed into the short stipe, coriaceous, inside glabrous, outside pubescent when young, diagonally striate.

CULION, *Merrill 450*, December, 1902, on dry open grassy hillsides.

The alliance of this species is with *Connarus neurocalyx* Planch., but it is readily distinguished by its much denser indumentum, short leaves, relatively much longer panicle, its petals adherent by their margins above the ovary, and its follicles glabrous within.

5. **Connarus obtusifolius** Planch. in Linnaea **23** (1850) 428; Walp. Ann. **2** (1851) 301; Miq. Fl. Ind. Bat. 1^2 (1859) 665; Vid. Phan. Cuming. Philip. (1885) 106, Rev. Pl. Vasc. Filip. (1886) 103; F.-Vill. Nov. App. (1883) 57.

The type of this species is *Cuming* 959, from the Province of Pampanga, Luzon. It appears to me, from the description, and the fragment of Cuming's specimen before me, to be very closely allied to and perhaps not distinct from *C. neurocalyx* Planch. *For. Bur. 5446 Curran*, from the Province of Bataan, Luzon, may be referable to it.

Endemic.

6. **Connarus neurocalyx** Planch. Linnaea **23** (1850) 248; Walp. Ann. **2** (1851) 300; Miq. Fl. Ind. Bat. 1^2 (1859) 665; F.-Vill. Nov. App. (1883) 56; Vid. Sinopsis Atlas (1883) *t. 39, f. E.*, Phan. Cuming. Philip. (1885) 106, Rev. Pl. Vasc. Filip. (1886) 103; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 61.

LUZON, without locality, *Loher 2096:* Province of Bataan, *For. Bur. 2030 Borden, Williams 562, Bur. Sci. 1576 Forworthy:* Province of Rizal, *Bur. Sci. 38 Foxworthy, Merrill 1705, 1884, Bur. Sci. 2685 Ramos, For. Bur. 391 Ahern's collector:* Province of Pampanga, *Merrill 1388:* Province of Laguna, *Elmer 8309,*

For. Bur. 8868 Curran: Province of Bulacan, *For. Bur. 7200 Curran:* Province of Camarines Sur, *Ahern 218.* NEGROS, *For. Bur. 7309 Everett.*

The type of this species is *Cuming 1762,* from the island of Cebu. F.-Villar erroneously reduces to it *Cnestis volubilis* Blanco, which appears to me to be referable to *Rourea,* rather than to *Connarus.*

Endemic.

7. **Connarus hallieri** sp. nov.

Frutex scandens inflorescentiis exceptis glaber; foliis imparipinnatis, 12 ad 20 cm longis, foliolis 5, oblongo-ovatis vel elliptico-ovatis, subcoriaceis, nitidis, basi acutis vel subrotundatis, apice subcaudato-acuminatis, utrinque plus minus glanduloso-punctatis, nervis utroque latere 5 ad 7, subtus prominentibus, ascendentibus; sepalis petalisque pubescentibus; staminibus 10, inaequalibus, filamentis pubescentibus; carpellis ellipsoideis, pubescentibus, stylo 4 mm longo; folliculis anguste cylindraceis, leviter falcatis vel rectis, basi angustatis, apice acutis, extus glabris, leviter longitudinaliter striatis, intus villosis, circiter 4 cm longis.

A scandent shrub, glabrous except the inflorescence. Branches brown, lenticellate. Leaves odd-pinnate, alternate, 12 to 20 cm long, the leaflets 5, oblong-ovate to elliptic-ovate, subcoriaceous, base rounded or acute, apex subcaudate-acuminate, acumen obtuse, 6 to 10 cm long, 3 to 4 cm wide, shining, both surfaces rather prominently and densely glandular-punctate; nerves 5 to 7 on each side of the midrib, rather distinct beneath, ascending, curved, obscurely anastomosing, the reticulations rather fine and dense; petiolules 2 to 3 mm long. Panicles terminal and axillary, pubescent, somewhat diffuse, many flowered, about 10 cm long, the peduncle and rachis stout. Sepals ovate-lanceolate, pubescent. Petals narrowly oblong, about 6 mm long, 1.5 to 2 mm wide, pubescent, glandular-dotted. Stamens 10, alternating long and short, the filaments slightly pubescent. Carpel 1, pubescent; style stout, pubescent, 4 mm long. Follicle narrowly cylindric, slightly falcate or straight, base narrowed, apex acute, about 4 cm long, less than 1 cm thick, coriaceous, outside glabrous and, at least when young, slightly longitudinally striate, villous inside. Seed immature, arillate.

BASILAN, *Hallier s. n.,* January, 1904.

A species closely allied to *Connarus monocarpus* Linn., but distinct. *Elmer 7268* is very closely allied if not identical.

8. **Connarus mindanaensis** sp. nov.

Scandens, inflorescentiis exceptis glaber; foliis imparipinnatis, usque ad 25 cm longis, foliolis 5, ovato-ellipticis vel oblongo-ellipticis, subcoriaceis, nitidis, basi acutis vel subacutis, rariter subrotundatis, apice valde acuminatis, nervis utrinque 4 vel 5, ascendentibus, subtus prominentibus; paniculis axillaribus terminalibusque, ferrugineo-pubescentibus, folia subaequantibus, multifloris; sepalis petalisque glanduloso-punctatis, subaequalibus; staminibus 10; carpellis anguste ovoideis, dense pubescentibus; folliculis aurantiacis, 2.5 cm longis, firmiter coriaceis, nitidis, inflatis, extus glabris, vix striatis, intus tomentosis.

A scandent shrub, glabrous except the inflorescence. Branches dark-brown or grayish, somewhat lenticellate. Leaves alternate, odd-pinnate, 15 to 25 cm long, the rachis swollen at the base; leaflets 5, the lateral ones opposite and smaller than the terminal one, subcoriaceous, glabrous, shining, ovate-elliptic or oblong-elliptic, 6 to 11 cm long, 2.5 to 5 cm wide, base acute or subacute, rarely somewhat rounded, margins entire, sometimes recurved, apex strongly acuminate, the acumen blunt; nerves 4 or 5 on each side of the midrib, ascending, curved, laxly anastomosing, prominent beneath, the reticulations very lax, the finer ones obsolete; petiolules about 4 mm long. Panicles terminal and axillary, as long as the leaves, densely ferruginous-pubescent, many-flowered. Sepals free, oblong, obtuse or acute, pubescent, distinctly glandular-punctate, 4 to 5 mm long. Petals about the same length as the sepals, glabrous or subglabrous, glandular-punctate, elliptic-ovate, obtuse. Stamens 10, alternating long and short, glabrous, the longer filaments 1.5 mm in length. Carpels 1, narrowly ovoid, densely pubescent; style very short, 0.5 mm long, glabrous or nearly so. Follicles orange-yellow, somewhat obovoid, 2.5 cm long, inflated, firmly coriaceous, obtuse, the stipe short, outside shining, glabrous, not striate, inside somewhat tomentose.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 754*, September–October, 1906, and without number (type), March, 1907.

9. **Connarus whitfordii** sp. nov.

Frutex scandens, inflorescentiis exceptis glaber; foliis imparipinnatis, 10 ad 15 cm longis, foliolis 5, lateralibus subopppositis vel alternis, oblongo-ellipticis vel oblongo-ovatis, firmiter membranaceis, nitidis, apice sensim acuminatis, obtusis, basi subrotundatis, nervis utrinque 3 ad 5; paniculis axillaribus terminalibusque, folia aequantibus vel multo longioribus, dense brunneo-pubescentibus; sepalis coriaceis, arcuatis, dense pubescentibus; petalis oblongo-linearibus, utrinque plus minus pubescentibus, glanduloso-punctatis; staminibus 10, inaequalibus, filamentis pubescentibus; carpellis ovoideis, pubescentibus; folliculis 2.5 cm longis, inflatis, ellipsoideis, extus glabris, obscure reticulato-striatis, intus pubescentibus.

A scandent shrub, glabrous except the inflorescence. Branches grayish-brown, terete, lenticellate. Leaves alternate, 10 to 15 cm long, the leaflets 5, the lateral ones subopposite or alternate, oblong-elliptic or oblong-ovate, firmly membranaceous, shining, 4 to 7 cm long, 2 to 3 cm wide, base usually rounded, apex gradually and prominently acuminate, acumen obtuse, margins entire, recurved; nerves 3 to 5 on each side of the midrib, rather distinct beneath, the reticulations faint; petiolules about 2 mm long. Panicles axillary and terminal, equaling or much exceeding the leaves, densely brown-pubescent, the buds densely congested on the ultimate branchlets. Sepals coriaceous, arched, oblong, 3 mm long, pubescent, opaque. Petals linear-oblong, obtuse, somewhat pubescent on both surfaces, glandular-punctate, 5.5 to 6 mm long, 1.2 mm wide, the

basal portion inflated, the margins just above the carpels adherent into a narrow tube, above entirely free. Stamens 10, alternating long and short, the filaments somewhat pubescent, the longer ones 4 mm, the shorter 1 mm in length. Carpels 1, ovoid, pubescent; style 1.5 mm long, slightly pubescent. Follicle firmly coriaceous, ellipsoid, inflated, 2.5 cm long, outside glabrous, shining, faintly diagonally reticulate-striate, inside pubescent, the stipe very short.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9185 Whitford & Hutchinson*, January, 1908, in dipterocarp forests at an altitude of about 20 m.

10. **Connarus subinaequifolius** Elm. Leafl. Philip. Bot. 1 (1908) 297.

Scandens; foliis usque ad 35 cm longis, imparipinnatis, foliolis 7, circiter 12 cm longis, 4.5 cm latis, oblongis, breviter abrupte acuminatis, basi rotundatis, firmiter membranaceis vel subcoriaceis, supra glabris, nitidis, subtus plus minus ferrugineo-pubescentibus, nervis utrinque 4 ad 6, prominentibus. Folliculis sublignosis, obovoideis, compressis, 5 cm longis, 3.5 cm latis, circiter 2.5 cm crassis, extus plus minus ferrugineo-tomentosis, subglabrescentibus, vix striatis, intus ferrugineo-tomentosis; seminibus oblongis, basi arillatis.

The type of this species is *Elmer 9422* from Mount Banajao, Province of Tayabas, Luzon, which I have not seen. *Elmer 9341* from the same locality is referable here, and also *Elmer 6208* from Sablan, Province of Benguet, Luzon, the latter being mentioned in the original description but without citation of the number. The flowers are unknown.

Endemic.

2. ELLIPANTHUS Hook. f.

1. Petioles 10 to 15 mm long, the leaf-base subacute, not peltate.... 1. *E. luzoniensis*
1. Petioles 3 to 4 mm long, the leaf-base broad, rounded or subcordate, minutely peltate ..... 2. *E. mindanaensis*

1. **Ellipanthus luzoniensis** Vid. Rev. Pl. Vasc. Filip. (1886) 104; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 61.

E. helferi Vid. Sinopsis Atlas (1883) *t. 39, f. B*, non Hook. f.

E. calophyllus F.-Vill. Nov. App. (1883) 351 (probably), non Kurz.

E. tomentosus F.-Vill. l. c., non Kurz.

LUZON, Province of Rizal, *For. Bur. 1998, 2900, 2141 Ahern's collector:* Province of Bulacan, *For. Bur. 7446 Curran, For. Bur. 12305 Maule:* Province of Bataan, *For. Bur. 2200, 2239 Meyer, Whitford 1051, For. Bur. 6407 Curran, For. Bur. 1426, 1505 Ahern's collector, Elmer 6692, 6883, 6889, For. Bur. 812, 1742, 1909, 2074, 2107, 2926 Borden.* LEYTE, *Elmer 7164.*

Endemic.

2. **Ellipanthus mindanaensis** sp. nov.

Arbor parva, ramulis junioribus fructibusque ferrugineo-pubescentibus; foliis oblongo-ellipticis vel ovato-ellipticis, subcoriaceis, usque ad 14 cm longis, apice acuminatis, basi late rotundatis vel leviter cordatis, levissime peltatis, integris, nitidis, supra glabris vel ad nervos minute pubescentibus, subtus ad costam nervosque pubescentibus, nervis 7 vel 8 utrinque; folliculis solitariis, longe pedicellatis, compressis, 3 cm longis, subfalcatis, acuminato-rostratis.

A small tree, the trunk about 4 cm in diameter. Branches reddish-brown, glabrous, the branchlets, especially the growing shoots, densely ferruginous-pubescent. Leaves oblong-elliptic or ovate-elliptic, subcoriaceous, 10 to 14 cm long, 5 to 6 cm wide, entire, the apex acuminate, the base broad, rounded or subcordate, very minutely subpeltate, shining, the upper surface glabrous, or the midrib and nerves minutely pubescent, beneath pubescent on the midrib and lateral nerves; nerves 7 or 8 on each side of the midrib, prominent, distant, curved, anastomosing, the reticulations lax, distinct; petioles pubescent, 3 to 4 mm long, jointed with the leaflet. Follicle densely ferruginous-pubescent, 3 cm long, 2 cm wide, compressed, subfalcate, base acute, apex acuminate-rostrate, the stalk 1.5 cm long. Seed subellipsoid, somewhat compressed, dark-colored, shining, 2.3 cm long, the aril very short.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9276 Whitford & Hutchinson*, January, 1908.

A species allied to *Ellipanthus luzoniensis* Vid. but readily distinguished by its very short petioles, subpeltate, broad, rounded or cordate leaf-base, prominent reticulations, and larger follicles.

3. ROUREA Aubl.

1. Leaflets 1 to 5 ..... 1. *R. volubilis*
1. Leaflets 11 to 15 ..... 2. *R. erecta*

1. **Rourea volubilis** (Blanco) Merr. in Govt. Lab. Publ. (Philip.) **27** (1905) 36; Philip. Journ. Sci. **1** (1906) Suppl. 61.

Cnestis volubilis Blanco Fl. Filip. (1837) 385.

Cnestis trifolia Blanco l. c. ed. 2 (1845) 270, ed. 3, **2:** 136, non Lam.

Rourea heterophylla Planch. in Linnaea **23** (1850) 419; Walp. Ann. **2** (1851) 297; Miq. Fl. Ind. Bat. 1^2 (1859) 658; Vid. Phan. Cuming. Philip. (1885) 106, Rev. Pl. Vasc. Filip. (1886) 103.

LUZON, Province of Benguet, *For. Bur. 14129 Merritt & Darling:* Province of Tayabas, *Cuming 752*, type collection of *Rourea heterophylla* Planch.: Province of Zambales, *Bur. Sci. 5064 Ramos:* Province of Rizal, *Merrill 1678, Loher 5139, Bur. Sci. 2657 Ramos:* Province of Bataan, *For. Bur. 1967 Borden.* MINDORO, *For. Bur. 4118 Merritt.* BALABAC, *Bur. Sci. 450 Mangubat.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 280:* District of Zamboanga, *For. Bur. 9307 Whitford & Hutchinson.*

In vegetative characters this species is exceedingly variable, the leaflets varying from one to seven, and on some specimens the same branches bearing 1–3- and 5-foliolate leaves. The flower and fruit characters appear to be rather constant.

This species has been reported from the Feejee Islands by A. Gray,[6] but possibly on an erroneous identification, or on a wrongly localized plant. Otherwise not reported from outside the Philippines.

2. **Rourea erecta** (Blanco) comb. nov.

Cnestis erecta Blanco Fl. Filip. (1837) 387.

Omphalobium pictum Blanco l. c. ed. 2 (1845) 271; ed. 3, **2:** 139.

Cnestis glabra Blanco l. cc. 387, 271, 138, non Lam.

Rourea multiflora Planch. in Linnaea **23** (1850) 418; Walp. Ann. **2** (1851) 297; Miq. Fl. Ind. Bat. 1^2 (1859) 658; F.-Vill. Nov. App. (1883) 56; Naves in

[6] Bot. Wilkes' U. S. Explor. Exped. (1854) 375.

Blanco Fl. Filip. ed. 3, *t. 140;* Vid. Sinopsis Atlas (1883) *t. 39, f. A,* Phan. Cuming. Philip. (1885) 106, Rev. Pl. Vasc. Filip. (1886) 102; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 61.

Omphalobium obliquum Presl Epim. Bot. (1851) 207.

Connarus obliquus Walp. Ann. 3 (1851) 844; Vid. Phan. Cuming. Philip. (1885) 106.

Connarus paniculatus F.-Vill. Nov. App. (1883) 57, ex syn. Blanco, non Roxb.

C. monocarpus F.-Vill. l. c. 57, ex syn. Blanco, non Linn.

LUZON, Province of Abra, *Bur. Sci. 7088 Ramos:* Province of Ilocos Norte, *For. Bur. 13801, 13828 Merritt & Darling:* Province of Pangasinan, *Cuming 949:* Province of Ilocos Sur, *Cuming 1172:* Province of Rizal, *Merrill 1859, 2645, 2723, 2828, Topping 751, For. Bur. 2655 Ahern's collector, Guerrero 42:* Province of Bataan, *Leiberg 6017, Merrill 2520, Whitford 323:* Province of Laguna, *Elmer.* LUBANG, *Merrill 974.* LEYTE, *For. Bur. 12424 Danao.* BANTAYAN, *Bur. Sci. 1697 McGregor.*

Blanco's description of *Cnestis erecta* applies exactly to the specimens above cited, and accordingly his specific name is here adopted, being the earliest valid one for the species. The name *erecta* is not particularly applicable, as only comparatively young plants are erect, mature ones being more or less procumbent or subscandent. However, the description can apply to no other Philippine species, as the five carpels mentioned by Blanco and the aril entirely covering the seed are characteristic of *Rourea,* and not of *Connarus.* Presl's *Omphalobium obliquum* has also been a somewhat doubtful species, it having been based on a specimen collected in Luzon by Haenke, and "Cuming 1171." The latter is undoubtedly an error for Cuming 1172, for 1171 in all herbaria that I have examined is *Mallotus muricatus* Muell. Arg., while Cuming 1172, specimens of which are before me, answers Presl's description perfectly. The date of Presl's "Epimeliae botanicae" is given on the title page as 1849, but it seems quite evident that the work did not appear until 1851 or 1852. Hooker [7] states regarding the work in question "although it bears on the title-page the date of 1849, it does not appear to have been in the hands of booksellers till the commencement of 1852." This is confirmed by the fact that it was not reviewed in the Botanische Zeitung until September, 1852. As Blanco's specific name for the plant under discussion is undoubtedly the oldest one, the question of actual date of publication of Presl's work is of no importance in the present case, but if Blanco's name be not accepted, there would be some doubt as to whether Presl's or Planchon's name had priority.

A common and widely distributed endemic species.

4. AGELAEA Soland.

1. Glabrous except the inflorescence, the follicles not or but very slightly rugose, scarcely beaked ..... 1. *A. wallichii*
1. All parts more or less pubescent, the follicles strongly tuberculate-rugose, prominently beaked ..... 2. *A. everettii*

1. **Agelaea wallichii** Hook. f. Fl. Brit. Ind. 2 (1876) 47; King in Journ. As. Soc. Beng. 66[2] (1897) 18; Merr. in Govt. Lab. Publ. (Philip.) 35 (1905) 19; Philip. Journ. Sci. 1 (1906) Suppl. 61.

A. vestita Vid. Sinopsis Atlas (1883) *t. 39, f. D,* non Hook.

LUZON, Province of Tayabas, *Merrill 2895:* Province of Bataan, *Leiberg 6004, For. Bur. 3025 Meyer, Whitford 29, For. Bur. 3043 Borden.*

Malay Peninsula to Singapore and Sumatra.

[7] Journ. Bot. & Kew Miscel. 4 (1852) 286.

2. Agelaea everettii sp. nov.

Frutex scandens, ramulis, petiolis, foliolis subtus, inflorescentiisque plus minus ferrugineo-pubescentibus; foliis alternis, trifoliolatis, racemis axillaribus vel extra-axillaribus, fasciculatis, circiter 2 cm longis; staminibus 10; folliculis solitariis, oblongis, 1.5 ad 2 cm longis, valde rostratis, extus tuberculato-rugosis, pubescentibus.

A scandent shrub more or less pubescent. Branches and branchlets terete, brownish, ferruginous-pubescent. Leaves alternate, trifoliolate, 15 to 20 cm long, the petiole pubescent, 5 to 6 cm long; leaflets chartaceous, the upper surface glabrous except the somewhat pubescent midrib and nerves, the lower surface paler, ferruginous-pubescent, ultimately subglabrous, the lateral ones inequilateral at the base, the terminal one equilateral, 7 to 15 cm long, 2.5 to 7 cm wide, entire, apex acuminate, acumen blunt; nerves 4 or 5 on each side of the midrib, prominent, ascending, anastomosing, the reticulations rather lax, distinct; petiolules densely pubescent, about 3 mm long. Racemes axillary or extra-axillary, about 2 cm long, fascicled, densely pubescent, the pedicels slender, pubescent, 1 to 2 mm long, the bracteoles densely pubescent, 1 to 1.5 mm long. Sepals oblong-lanceolate, pubescent, 3 mm long. Petals glabrous, linear-lanceolate, acuminate, 5 mm long, 1 mm wide. Carpels usually 5, narrowly lanceolate, pilose, 3 to 3.5 mm long including the styles. Stamens usually 10, sometimes fewer, unequal, 1 to 1.5 mm long. Follicles solitary, oblong, 1.5 to 2 cm long, apex strongly rostrate, the outside strongly tuberculate-rugose, densely ferruginous-pubescent; seed ellipsoid or narrowly obovoid, black, about 1 cm long.

Type specimen collected by *H. D. Everett, For. Bur. 4300*, Negros, June, 1906; also represented by *For. Bur. 4286, 5570 Everett*, May and June, 1906, the former from the Guimagaan River, the latter from Cadiz, Negros. Material collected by Cuming, no. 907, from the Province of Albay, Luzon, is probably the same, but no specimen is available here, although the one in the Kew Herbarium has been examined by me.

Agelaea everettii is apparently closely allied to **Agelaea borneensis** (Hook. f.) (*Hemiandrina borneensis* Hook. f., *Agelaea vestita* Hook. f.) of the Malay Peninsula and Borneo, but is distinguished by its 10 stamens, and less dense pubescence, although in the latter character the species seems to vary considerably, if all our Singapore specimens are correctly named. In regard to *A. borneensis*, Hooker's specific name under *Hemiandrina* is the oldest, and hence must be accepted, for the Wallichian name *Cnestis vestita* was not published until 1876, and then only as a synonym. Gilg and Boerlage maintain *Troostwyckia* Miq., as a distinct genus, although Hooker f. reduced *T. singularis* Miq., on which the genus was based, to *Aeglaea vestita* Hook. f.

5. CNESTIS Juss.

1. **Cnestis diffusa** Blanco Fl. Filip. (1837) 386.

Cnestis polyphylla Blanco l. c. ed. 2 (1845) 270; ed. 3, **2**: 137, non Lam.

Cnestis corniculata Blanco Fl. Filip. (1837) 386, ed. 2 (1845) 270, ed. 3, **2**: 138, non Lam.

Cnestis ramiflora Griff. Not. 4 (1854) 432; Kurz in Journ. As. Soc. Beng. **45**[2] (1876) 216; Hook. f. Fl. Brit. Ind. **2** (1876) 54; Vid. Sinopsis Atlas (1883)

t. 39, f. C; Phan. Cuming. Philip. (1885) 106; Rev. Pl. Vasc. Filip. (1886) 103; F.-Vill. Nov. App. (1883) 57; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 61; King in Journ. As. Soc. Beng. **66**[2] (1897) 21.

Rourea dasyphylla Miq. Fl. Ind. Bat. Suppl. (1861) 528.

Connarus foliosus Jack in Wall. Cat. (1828) no. 8529, *nomen.*

Connarus igneus Wall. l. c. no. 8528, *nomen.*

Rourea rugosa F.-Vill. Nov. App. (1883) 56, non Planch.

Connarus ferrugineus F.-Vill. l. c. 57, non Jack.

LUZON, Province of Ilocos Sur, Tagudin, *Guerrero s. n.:* Province of Union, *Elmer 5544:* Province of Pangasinan, *Cuming 951:* Province of Bataan, *Topping 529, For. Bur. 2592 Meyer, For. Bur. 2567 Borden:* Province of Rizal, *Merrill 1327, 2341, For. Bur. 2656 Ahern's collector:* Province of Laguna, *Elmer.* LUBANG, *Merrill 965.* BURIAS, *For. Bur. 1726 Clark.*

Burma to the Malay Peninsula and Sumatra.

Blanco's name for this species is the oldest valid one that I have been able to find, and it is here accordingly adopted. He describes the fruits as "without hairs" which hardly applies to the above species, but in spite of this discrepancy I am of the opinion that the plant he had in mind was really the above, as in other characters his description applies perfectly, and does not at all apply to any other species of *Connaraceae* known to me. The species is moreover common in the regions from which Blanco received most of his material, and would hardly have been overlooked by him. F.-Villar erroneously reduced *Cnestis diffusa* Blanco to *Rourea rugosa* Planch., a species that does not extend to the Philippines, and one to which Blanco's description does not at all apply. *Cnestis corniculata* Blanco, non Lam., is certainly referable here. I had suspected this from Blanco's description, and to verify it, Dr. Leon Ma. Guerrero kindly secured for me from Blanco's type locality, Tagudin, specimens of the plant known there as *Sal-laday;* these specimens prove to be the same as *C. diffusa* Blanco. *C. corniculata* Blanco was erroneously reduced by F.-Villar to *Connarus ferrugineus* Jack, a species that does not extend to the Philippines.

EXCLUDED SPECIES.

ROUREA SANTALOIDES W. & A.; F.-Vill. Nov. App. (1883) 56.

ROUREA COMMUTATA Planch.; F.-Vill. l. c.

The above two species were credited to the Philippines by F.-Villar, but probably do not extend to the Archipelago.

A REVISION OF PHILIPPINE LORANTHACEÆ.

By E. D. Merrill.

(From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.)

The greatest difficulty in dealing with this family is in connection with the generic limits of *Loranthus,* to determine whether or not to follow Bentham and refer all the forms to one great genus with numerous sections, or to follow Van Tieghem, recognizing a great number of small, more or less closely allied genera, or to follow Engler, who chooses a middle course, recognizing a few genera, several of them large and with numerous subgenera. After considerable preliminary work on the group, I decided to follow Bentham, excluding, however, the species with versatile anthers, of which we have a single representative in the Philippines, as his arrangement on the whole seemed to me to be the most logical and simple one. The difficulty with Van Tieghem's system is that his work is not sufficiently amplified, his generic and specific descriptions being too short, and frequently almost wanting, so that it is quite difficult, if not impossible, to follow him closely, unless one has access to the specimens cited by him. After a careful study of the material available here, I am now rather firmly convinced that there is no middle ground to be taken in the matter, and that one must refer most of the species to a single, or at most two or three large and small genera, or one must follow Van Tieghem, and recognize numerous small and more or less closely allied genera, only in the latter case it will be necessary to establish a considerable number of new genera to accommodate numerous Philippine and Malayan species that can not be fitted into any of those proposed by him.

It is fortunate that there is in the herbarium of this Bureau a nearly complete set of Cuming's Philippine *Loranthaceæ,* so that it has been possible for me accurately to identify most of the species established by Van Tieghem based on this collection; without these specimens it is quite impossible to identify the species on account of the short descriptions. The other material cited is entirely of recent collection.

Six genera have been recognized, of which the largest is *Loranthus,* with forty-three species, although specimens not in proper condition for complete descriptions, at present in our herbarium, would bring this list up to about fifty. When material available has not allowed me to place the species in its proper section, I have refrained from describing such plants, and a number of these, at present represented by incomplete

material, will have to be considered at a later date, when more complete specimens are available. *Phrygilanthus,* included by Bentham in *Loranthus,* but distinguished primarily by its versatile anthers, is here retained as a genus, and is represented in the Archipelago by a single species, which must be considered as an Australian type. *Cleistoloranthus,* remarkable for its cylindric corolla-tube entirely closed at the apex by the inward projecting and connate basal portions of the lobes, and by its very short, spreading, irregularly toothed, external portions of the lobes which are broader than long, is described as a new genus. *Viscum* is represented by four species, all of wide distribution; *Notothixos* by three endemic species, and *Ginalloa* by a single endemic species. The table below gives some idea of the distribution in this part of the world of the genera and species, the latter being much more strongly developed in the Malay region than to the north and south. *Arceuthobium,* with one species in the Himalayan region, and *Nuytsia* and *Atkinsonia* (*Gaiadendron*) with one species each in Australia, are not included in the table.

Genera.	India, including the Malay Peninsula.[1]	Malay Archipelago and Peninsula.[2]	China.[3]	Australia.[4]	Philippines.
Loranthus	69[a]	96	16	16	43
Cleistoloranthus	0	0	0	0	1
Phrygilanthus	0	0	0	3[b]	1
Viscum	11	6	4	3	4
Notothixos	2	1	0	3	3
Ginalloa	3	4	0	0	1
Total	85	107	20	25	53

[a] Including additional species described by King in Journ. As. Soc. Beng. **56** [2] (1888) 89–100.
[b] Included in *Loranthus.*

KEY TO THE PHILIPPINE GENERA OF LORANTHACEÆ.

1. Flowers 2-sexual.
   2. Anthers basifixed.
      3. Corolla-tube open, variously cleft or divided, the lobes often entirely free, linear, reflexed or erect ..... 1. *Loranthus*
      3. Corolla-tube cyclindric, closed at the top by inward projecting processes of the four very short broad, spreading lobes, the flowers cleistogamous. 2. *Cleistoloranthus*
   2. Anthers versatile ..... 3. *Phrygilanthus*

1. Flowers 1-sexual.
   2. Anthers adnate to the petals, opening by pores; plants glabrous.... 4. *Viscum*
   2. Anthers at the base of the petals, many-celled; plants, or at least the young parts, densely yellowish- or grayish-puberulent, often mealy-glandular. 5. *Notothixos*
   2. Anthers at the base of the petals, 2-celled; plants glabrous..... 6. *Ginalloa*

[1] Hook. f. Fl. Brit. Ind. **5** (1886) 203–228.
[2] Boerlage Handl. Fl. Nederl. Ind. **3**[1] (1900) 162–167.
[3] Hemsley in Journ. Linn. Soc. Bot. **26** (1894) 405–408.
[4] Bentham Fl. Austral. **3** (1866) 387–397.

1. LORANTHUS Linn.

1. Petals entirely free; flowers subtended by a single bract.
   2. Flowers small, less than 1 cm long, 5-merous, arranged in axillary spikes or racemes; buds strongly constricted in the median portion, base and apex inflated. § PHOENICANTHEMUM.
      3. Flowers racemose ..... 1. *L. pentapetalus*
      3. Flowers spicate ..... 2. *L. sessiliflorus*
   2. Flowers medium, 1 to 4 cm long, rarely smaller, 4- to 6-merous, arranged in axillary fascicles, cymes or racemes; buds not constricted in the median portion. § HETERANTHUS.
3. Leaves whorled.
   4. Flowers 5-merous.
      5. Leaves petioled.
         6. Leaves oblong-ovate to elliptic-ovate, apex blunt-acuminate or acute, 8 cm long or more..... 3. *L. basilanensis*
         6. Leaves narrowly obovate-elliptic, rounded at the apex, 7 cm long or less ..... 4. *L. merrittii*
      5. Leaves sessile ..... 5. *L. benguetensis*
   4. Flowers 4-merous.
      5. Leaves sessile ..... 6. *L. luzonensis*
      5. Leaves petioled.
         6. Inflorescences scattered along the branches..... 7. *L. mirabilis*
         6. Inflorescences at the nodes only..... 8. *L. acutus*
3. Leaves opposite, subopposite or alternate.
   4. Flowers 4-merous.
      5. Flowers less than 1 cm long; leaves lanceolate..... 9. *L. tenuis*
      5. Flowers nearly 2.5 cm long; leaves elliptic-ovate to elliptic-obovate. 10. *L. mearnsii*
   4. Flowers 5-merous.
      5. Leaves all petioled.
         6. Leaves acute or acuminate at the apex.
            7. Flowers all sessile, arranged in groups of threes along one side of the branches ..... 11. *L. cauliflorus*
            7. Flowers all pedicelled, arranged in slender, few-flowered cymes.
               8. Leaves about 20 cm long, prominently acuminate; flowers 3.5 cm long ..... 12. *L. lanaensis*
               8. Leaves 14 cm long or less, blunt, acute, or only slightly acuminate; flowers 3 cm long..... 13. *L. bicoloratus*
            7. Flowers in triads, all sessile, two triads on a short common peduncle ..... 14. *L. hexanthus*
         6. Leaves broad and rounded at their apices; flowers in pairs, which are fasciculate at the nodes..... 15. *L. hutchinsonii*
      5. Leaves sessile ..... 16. *L. cuernosensis*

1. Corolla-lobes more or less united, forming a short or long tube.
   2. Flowers 4-merous, small or medium, each subtended by a single small bract; corolla straight or curved, outside very densely tomentose or farinose. § CICHLANTHUS.
      3. Leaves usually less than 2 cm in width.
         4. Fruit ellipsoid, not at all narrowed at the base..... 17. *L. estipitatus*
         4. Fruit narrowly obovoid, gradually narrowed to the base. 18. *L. sphenoideus*

3. Leaves 2 to 5 cm wide.
4. Flowers, young leaves and branches densely covered with a rather pale, yellowish-brown tomentum ..... 19. *L. philippensis*
4. Tomentum dark-rusty-brown ..... 20. *L. ferrugineus*

2. Flowers 4- to 6-merous, usually 5-merous, each subtended by a single small bract, arranged in fascicles, cymes, or racemes; corolla straight or curved, glabrous or only slightly pubescent. § Dendrophthoë.
3. Inflorescence of axillary, solitary or fascicled, often very short, simple racemes.
4. Leaves sessile and strongly cordate at the base..... 21. *L. hallieri*
4. Leaves distinctly petioled, acute or acuminate at the base.
5. Flowers more or less curved, 3 to 4 cm long.
6. Leaves prominently 5-plinerved, obtuse; racemes very short, fascicled ..... 22. *L. clementis*
6. Leaves not 5-plinerved; racemes solitary, in pairs, or fasciculate, elongated.
7. Leaves lanceolate, about 15 cm long; racemes fascicled. 23. *L. copelandii*
7. Leaves elliptic-ovate to elliptic-oblong, less than 10 cm long; racemes solitary or in pairs..... 24. *L. loheri*
5. Flowers straight, about 1.5 cm long..... 25. *L. pentandrus*

3. Inflorescence of racemosely disposed triads.
4. Flowers all sessile.
5. Petioles 1 to 1.5 cm long.
6. Corolla about 1.5 cm long, somewhat inflated.. 26. *L. subalternifolius*
6. Corolla 2 cm long, very slender, not at all inflated.. 27. *L. boholensis*
5. Petioles 3 mm long or less or the leaves sessile.
6. Leaves lanceolate to ovate, sessile, the lateral nerves 6 to 8, obscure; corolla about 2 cm long..... 28. *L. secundiflorus*
6. Leaves ovate to elliptic-ovate, short-petioled, the lateral nerves 3 or 4, rather distinct, the reticulations lax; corolla 1.5 cm long. 29. *L. mindanaensis*

4. Central flower of each triad sessile, the two lateral ones short- or long-pedicelled.
5. Leaves rounded or acute at the base, the petioles elongated.
6. Inflorescence cauline; pedicels of the lateral flowers very short, 1 mm long or less..... 30. *L. revolutus*
6. Inflorescence axillary and terminal, lax; pedicels of the lateral flowers elongated.
7. Inflorescence lepidote; leaves acute or slightly acuminate. 31. *L. ahernianus*
7. Inflorescence glabrous; leaves strongly caudate-acuminate. 32. *L. acuminatissimus*
5. Leaves strongly cordate at the base, short-petioled; pedicels of the lateral flowers short..... 33. *L. ovatifolius*

3. Inflorescence of umbellately disposed triads.
4. Leaves whorled ..... 34. *L. halconensis*
4. Leaves opposite or alternate.
5. Flowers 5- and 6-merous in the same umbels..... 35. *L. haenkeanus*
5. Flowers 4-merous ..... 36. *L. curranii*

3. Inflorescence of terminal and axillary cymes; flowers 6-merous. 37. *L. viridis*

3. Inflorescence of sessile fascicled flowers, axillary or at the nodes.
4. Leaves sessile; flowers 5-merous..... 16. *L. cuernosensis*

4. Leaves petioled; flowers 6-merous..... 38. *L. banahaensis*
2. Each flower subtended by a bract, and by an additional pair of similar, usually smaller bracteoles, these bracteoles free or united into a single retuse one. § MACROSOLEN.
3. Flowers in simple racemes, each flower subtended by a small bract and two smaller, free bracteoles..... 39. *L. ampullaceus*
3. Flowers in triads, each peduncle bearing two triads, the flowers 5-merous, all sessile ..... 40. *L. macgregorii*
3. Flowers in pairs, each peduncle bearing two sessile, 6-merous flowers. 41. *M. geminatus*
2. Flowers in axillary, sessile fascicles, which are surrounded by large, ovate to elliptic, imbricated, deciduous bracts, entirely inclosing the young inflorescence. § LEPIOSTEGERES.
3. Flowers about 30 in each head..... 42. *L. congestiflorus*
3. Flowers 4 in each head..... 43. *L. williamsii*

§ PHOENICANTHEMUM.

1. **Loranthus pentapetalus** Roxb. Fl. Ind. 1 (1820) 190; DC. Prodr. 4 (1830) 295; Blume Fl. Jav. Loranth. (1828) 39, *t. 14, 23A;* Hook. f. Fl. Brit. Ind. 5 (1886) 206; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26 (1894) 406; Rolfe in Journ. Bot. 23 (1885) 215; Vid. Phan. Cuming. Philip. (1885) 140, Rev. Pl. Vasc. Filip. (1886) 231; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 50.

Lanthorus spicifer Presl Epim. Bot. (1851) 257; Walp. Ann. 2: 727; Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 487.

Phoenicanthemum pentapetalum Miq. Fl. Ind. Bat. 1[1] (1856) 823.

Dendrophthoë pentapetala G. Don Gen. Hist. 3 (1832) 419.

Loranthus spicifer F.-Vill. Nov. App. (1883) 183; Vid. Rev. Pl. Vasc. Filip. (1886) 231.

Lanthorus blumeanus Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 488.

Lanthorus pentasepalus Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 488.

Lanthorus cumingii Van Tiegh. l. c.

Loranthus cumingii Engl. Nat. Pflanzenfam. Nachtr. 1 (1897) 128.

Loranthus blumeanus Engl. l. c.

PHILIPPINES, without locality, *Cuming 1949*, type number of the genus *Lanthorus* Presl; *Cuming 1975*, type number of *Lanthorus cumingii* Van Tiegh. BABUYANES Islands, Camiguin, *Bur. Sci. 4111 Fénix.* LUZON, Province of Benguet, Ambuklao to Daklan, *Merrill 4402;* Baguio, *For. Bur. 4901 Curran, Elmer 8493;* Kias Hill, *Williams 932:* Province of Pampanga, Mount Abu, *Bur. Sci. 1993 Foxworthy:* Province of Bataan, Lamao River, *Whitford 1219, For. Bur. 2243 Meyer, Elmer 6891, For. Bur. 80 Barnes:* Province of Rizal, Bosoboso, *Merrill 1832, For. Bur. 2134 Ahern's collector, Bur. Sci. 1499 Ramos:* Province of Tayabas, *Elmer 9174:* Province of Camarines, *For. Bur. 12291 Curran.*

Nepal to Burma and southern China, the Malay Peninsula, Sumatra, Java, and Borneo.

A widely distributed species, with rather constant characters, considering its range. I am unable to distinguish any constant characters by which the four species recognized by Van Tieghem, *Lanthorus pentapetalus, L. spicifer, L. cumingii,* and *L. blumeanus,* can be separated from *Loranthus pentapetalus* Roxb.

2. **Loranthus sessiliflorus** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 188.

LUZON, Province of Benguet, Baguio, *Elmer 6057:* Province of Bataan, Lamao River, *Whitford 1171:* Province of Tayabas, Lucban, *Elmer 7845.* MINDORO, Baco, *Merrill 1242, 4041, McGregor 125;* Aglubang River, *For. Bur. 11499 Merritt.*

Endemic.

§ HETERANTHUS.

3. **Loranthus basilanensis** sp. nov.

Glaber; foliis verticillatis, coriaceis, elliptico-ovatis vel oblongo-ovatis, usque ad 11 cm longis, utrinque acutis, vel apice leviter acuminatis, basi interdum rotundatis, petiolatis, nervis utrinque 3 vel 4, subobsoletis; floribus 5-meris, in cymis brevibus axillaribus solitariis binis vel fasciculatis dispositis; petalis liberis, circiter 1.5 cm longis.

Glabrous throughout. Branches terete, grayish or brownish, smooth, Leaves three or four at each node, verticillate, elliptic-ovate to oblong-ovate, 6 to 11 cm long, 2.5 to 5 cm wide, brown when dry, dull, acute at both ends, or the apex sometimes slightly acuminate and the base rounded; nerves 3 or 4 on each side of the midrib, very obscure, the reticulations obsolete; petioles 5 to 10 mm long. Cymes axillary, solitary, in pairs, or fascicled at the nodes, the rachis less than 1 cm long. Flowers yellow, pedicelled, each subtended by a single small bracteole. Calyx cup-shaped, 3 mm long, the limb produced, truncate. Petals 5, about 15 cm long, 1 mm wide, free, the portion above the insertion of the stamens reflexed; filaments 2 mm long; anthers continuous, 3 mm long.

BASILAN, Matangal Point, *For. Bur. 3447 Hutchinson*, December, 1907. An unnumbered specimen collected on Basilan by *Hallier*, in January, 1904, is probably referable here, as well as *Copeland 376*, from Davao, Mindanao.

4. **Loranthus merrittii** nom. nov.

Loranthus nodosus Engl. Nat. Pflanzenfam. Nachtr. 1 (1897) 128, non Desr.

Stemmatophyllum nodosum Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 506.

PHILIPPINES, without locality, *Cuming 1952, 1958*, the former the type number. LUZON, near Manila, *Merrill 3494, Loher 4463:* Province of Pangasinan, *For. Bur. 8348 Curran & Merritt:* Province of Bataan, near Bagac, *For. Bur. 5977 Curran.* LUBANG, *Merrill 960.* MINDORO, Cauayan, *For. Bur. 9893 Merritt.*

Endemic.

5. **Loranthus benguetensis** sp. nov.

Glaber; foliis verticillatis, ternis vel quaternis, oblongo-ellipticis vel lanceolato-ellipticis, obtusis, sessilibus, crasse coriaceis, nitidis, usque ad 4 cm longis; floribus 5-meris, glabris, in triadibus dispositis, omnibus breviter pedicellatis; triadibus umbellatim dispositis, pedunculis axillaribus, solitariis.

Glabrous throughout. Branches stout, terete, dark-colored and almost black when dry, somewhat shining. Leaves verticillate, three or four at each node, sessile, oblong-elliptic to lanceolate-elliptic, obtuse, the base acute, thickly coriaceous, shining, 3 to 4 cm long, 1 to 1.3 cm wide, the midrib faint, the lateral nerves and reticulations obsolete. Inflorescence axillary, solitary, the peduncles slender, about 1 cm long, each with about four short branches umbellately disposed at the apex, these branches about

4 mm long and each in turn bearing a single triad of flowers, all the flowers shortly pedicelled, the pedicels 1 to 1.5 mm long. Calyx narrowly funnel-shaped, 3 mm long, the limb produced, truncate or minutely toothed, each subtended by a small bract. Petals 5, free, glabrous, about 2.2 cm long, 1.5 mm wide, the reflexed portion 5 to 6 mm long. Filaments 1 to 2 mm long; anthers continuous, obtuse, 3 mm long.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16064 Curran, Merritt, & Zschokke,* January, 1909, parasitic on *Pinus insularis,* altitude about 1,200 m. Apparently also represented by immature specimens from the same province, *Bur. Sci. 2712 Mearns,* April, 1907.

Manifestly closely allied to *Loranthus luzonensis,* but with smaller, shining leaves, and 5-merous, quite glabrous flowers.

6. **Loranthus luzonensis** Presl ex Schultes f. Syst. Veg. 7 (1829) 104; Vid. Phan. Cuming. Philip. (1885) 140, Rev. Pl. Vasc. Philip. (1886) 232; F.-Vill. Nov. App. (1883) 183.

Dendrophthoë luzonensis G. Don Gen. Hist. 3 (1834) 421; Miq. Fl. Ind. Bat. 1[1] (1857) 818.

Stemmatophyllum luzonense Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 505.

Loranthus forsterianus Llanos in Mem. Ac. Cienc. Madr. 4 (1858) 501; Blanco Fl. Filip. ed. 3, 4: 102, non Schultes, fide F.-Villar.

PHILIPPINES, without locality, *Cuming 1964:* Province of Union, Bauang, *Elmer 5693:* Province of Abra, *Bur. Sci. 7250 Ramos:* Province of Benguet, *For. Bur. 10922 Curran, For. Bur. 15893 Bacani:* Province of Zambales, *For. Bur. 5927 Curran, For. Bur. 11050 Zschokke.*

Endemic.

From the meager description given by Van Tieghem, and the fragment of *Cuming 1956* before me, on which *Stemmatophyllum sessilifolium* Van Tiegh. (*Loranthus sessilifolius* Engl.) was based, I can not distinguish the species from the above.

7. **Loranthus mirabilis** Van Huerck & Muell. Arg. in Act. Soc. Helv. Sci. Nat. 55 (1872) 47; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 187.

Stemmatophyllum cumingii Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 505.

Loranthus cumingianus Engl. Nat. Pflanzenfam. Nachtr. 1 (1897) 128, non *L. cumingii* Engl. l. c.

PHILIPPINES, without locality, *Cuming 1966,* type number: LUZON, Province of Bataan, Mount Mariveles, *Copeland s. n.,* April, 1906.

In my previous consideration of *Loranthus mirabilis*[5] the specimens cited, other than *Cuming 1966,* do not belong to this species.

Endemic.

8. **Loranthus acutus** (Van Tiegh.) Engl. Nat. Pflanzenfam. Nachtr. 1 (1897) 128.

Stemmatophyllum acutum Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 546.

PHILIPPINES, without locality, *Cuming 1973,* type number. LUZON, Province of Benguet, *Williams 1021, 1319, Elmer 5809, Merrill 4377, For. Bur. 15982 Bacani.*

Endemic.

[5] *This Journal* 1 (1906) *Suppl.* 187.

9. **Loranthus tenuis** sp. nov.

Glaber, ramulis juvenilibus inflorescentiisque exceptis; ramis ramulisque tenuibus, griseo-brunneis, teretibus, lenticellatis; foliis oppositis, suboppositis vel alternis, lanceolatis, usque ad 6 cm longis, utrinque angustatis, apice acuminatis, petiolatis, nervis utrinque circiter 5, subobsoletis; cymis axillaribus, solitariis, vix 1.5 cm longis, 3-floris; floribus leviter ferrugineo-puberulis, 4-meris; petalis liberis, 5 mm longis.

Glabrous except the young branchlets and inflorescence. Branches slender, brownish-gray, terete, lenticellate, glabrous, the young branchlets slightly ferruginous-puberulent. Leaves opposite, subopposite or alternate, coriaceous, glabrous, dull, lanceolate, 3.5 to 6 cm long, 0.8 to 1.8 cm wide, narrowed at both ends, the apex acuminate, acumen blunt, base acute or acuminate; nerves 4 or 5 on each side of the midrib, very obscure, the reticulations obsolete; petioles slender, 5 mm long or less. Cymes axillary, solitary, less than 1.5 cm long, 3-flowered, each therefore a simple triad with pedicelled flowers, the pedicels about 2 mm long. Calyx cup-shaped, 1.8 to 2 mm long, obscurely 4-toothed or subtruncate, the limb slightly produced, ferruginous-puberulent, subtended by a single, ovate, obtuse bract about 1 mm long. Petals 4, free, linear or oblong-linear, ferruginous-puberulent outside, obtuse, about 5 mm long, 0.5 to 0.7 mm wide. Anthers erect, continuous. Style 6 mm long; stigma capitate.

LUZON, Province of Bataan, Lamao River, Mount Mariveles, parasitic on *Diospyros pilosanthera* Blanco in forests at an altitude of about 800 m, *For. Bur. 6287 Curran*, February, 1907.

A species well characterized by its slender branches, narrow, lanceolate leaves, and simple, solitary triads.

10. **Loranthus mearnsii** Merr. in Philip. Journ. Sci. 2 (1907) Bot. 271.

MINDORO, Mount Halcon, *Merrill 5733*, November, 1906.

Endemic.

11. **Loranthus cauliflorus** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 185.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 55*, and two sheets without number, January, March, May, 1906.

Endemic.

12. **Loranthus lanaensis** sp. nov.

Glaber; foliis suboppositis, coriaceis, lanceolatis vel late lanceolatis, in sicco brunneis, opacis, circiter 20 cm longis, basi acutis, apice valde acute acuminatis, petiolatis, nervis utrinque circiter 7, obscuris; cymis ad nodos solitariis vel fasciculatis, trichotomis, 9-floris; floribus omnibus pedicellatis, 5-meris; petalis liberis, 3 ad 3.5 cm longis.

Glabrous throughout. Branches stout, terete, gray or brown. Leaves subopposite, lanceolate or broadly lanceolate, 18 to 20 cm long, 4.5 to 6 cm wide, thickly coriaceous, brown when dry, dull, the base acute, the apex strongly and sharply acuminate, often somewhat falcate; nerves

about 8 on each side of the midrib, obscure; petioles stout, 2 to 3 cm long. Cymes solitary or few at the nodes, rarely additional ones scattered along the branches, the rachis less than 1 cm long, bearing at its apex three short branches, each branch in turn bearing three pedicelled yellow flowers, so that the cyme is made up of three triads. Pedicels 2 to 3 mm long, slender. Calyx 4.5 mm long, narrowed below, the limb produced, truncate, each subtended by a single, ovate, 1.2 mm long bract. Petals 5, free, 3 to 3.5 cm long, about 1.7 mm wide. Filaments 2 mm long; anthers continuous, 5 mm long.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens* 777, November, 1906, on trees overhanging the lake.

A species closely allied to *Loranthus bicoloratus* Elmer, but with much larger, differently shaped leaves, longer flowers and anthers.

13. **Loranthus bicoloratus** Elmer Leafl. Philip. Bot. 2 (1908) 470.

Glaber; foliis coriaceis, in sicco brunneis, opacis, oblongis vel late oblongo-lanceolatis, oppositis, petiolatis, 7 ad 14 cm longis, circiter 5 cm latis, basi acutis vel obtusis, apice acutis, obtusis, vel leviter acuminatis, nervis utrinque 3 ad 5, obscuris; cymis ad nodos solitariis vel 2 vel 3 fasciculatis; floribus omnibus pedicellatis, in triadibus 3 vel 4 dispositis; petalis 5, liberis, circiter 3 cm longis.

NEGROS, Cuernos Mountains, near Dumaguete, *Elmer 9950*, type number, collected on *Leucosyke*, in densely thicketed ravines at an altitude of about 760 m.

From the original description of the species, one would infer that it belongs in the section *Dendrophthoë*, but examination of type material shows that the petals are entirely free.

Endemic.

14. **Loranthus hexanthus** sp. nov.

Glaber; foliis oppositis, petiolatis, opacis, oblongo-ovatis, usque ad 10 cm longis, basi acutis vel acuminatis, apice obtusis, acutis vel acuminatis, rectis vel leviter falcatis, nervis utrinque circiter 3, obscuris, subobsoletis; pedunculis axillaribus, brevibus, 6-floris, floribus omnibus sessilibus, in triadibus 2 dispositis; petalis liberis, circiter 1.7 mm longis.

Glabrous throughout. Branches grayish-brown or dark-colored, terete. Leaves opposite, oblong-ovate, straight or slightly falcate, 8 to 10 cm long, 3 to 5 cm wide, thickly-coriaceous, brittle and dull when dry, brown, base acute or acuminate, apex obtuse, acute, or acuminate; nerves about 3 on each side of the midrib, very obscure, the reticulations often obsolete; petioles 1 cm long or less. Inflorescence axillary and at the nodes, the peduncles solitary or few at each node, 8 mm long or less, each peduncle bearing at its apex six sessile flowers, arranged in two triads, each flower subtended by a broadly ovate, obtuse bract about 2.5 mm long. Calyx 4 mm long, the limb produced, truncate or irregularly and obscurely toothed. Petals 5, free, about 1.7 cm long, the buds slightly angled, and a little enlarged at the apex, the portion

of the petals above the insertion of the stamens about 6 mm long. Anther 2.5 mm long, continuous; filament short.

MINDANAO, Lake Lanao, Vickers' Landing, *Mrs. Clemens s. n.*, September–October, 1906: District of Davao, Mount Apo, *Williams 2565*, April, 1905.

A species well characterized by its 6-flowered peduncles, the flowers all sessile and arranged in two triads at the apex of the peduncle.

15. **Loranthus hutchinsonii** sp. nov.

Glaber; foliis coriaceis, nitidis, brunneis, elliptico-ovatis, basi acutis, apice late rotundatis, oppositis vel subverticillatis, usque ad 8 cm longis, petiolatis, nervis utrinque 2 vel 3, subobsoletis; floribus ad nodos fasciculatis, breviter pedicellatis, 5-meris; petalis liberis, circiter 2 cm longis.

Glabrous throughout. Branches stout, terete, smooth, dark-reddish-brown, the internodes 3 to 5 cm long. Leaves opposite or subverticillate, thickly coriaceous, brown and somewhat shining when dry, elliptic-ovate, 5 to 8 cm long, 3.5 to 6 cm wide, the base acute, the apex broad, rounded, margins somewhat revolute; nerves two or three on each side of the midrib, indistinct, the reticulations obsolete, the midrib prominent; petioles 1 to 1.5 cm long. Flowers red, 2.2 cm long, the buds cylindric, fasciculate in the axils and at the nodes, three to ten or more flowers at each node, pedicellate, the pedicels about 2 mm long. Calyx about 4 mm long, cylindric, the limb produced, truncate, each subtended by a single, orbicular-ovate, obtuse, 1.5 mm long bracteole. Petals 5, free, linear, about 2 cm long, 2 mm wide, the portion above the insertion of the stamens 6 mm long. Stamens 6 mm long, the antheriferous portion continuous, 3 mm long.

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4554 Mearns & Hutchinson*, May, 1906, on trees in forests at an altitude of about 1,100 m.

16. **Loranthus cuernosensis** Elmer Leafl. Philip. Bot. 2 (1908) 469.

Glaber; foliis oppositis, sessilibus, coriaceis, usque ad 15 cm longis, 5 cm latis, in sicco brunneis, opacis, ovato-lanceolatis vel oblongis, basi late rotundatis vel obtusis, interdum inaequilateralibus, supra sensim angustatis, apice acutis vel acuminatis, nervis utrinque 3 ad 5, obscuris, reticulis obsoletis; floribus axillaribus, fasciculatis, 5-meris, circiter 2 cm longis.

NEGROS, Cuernos Mountains, near Dumaguete, *Elmer 9525*, March, 1908, in forests at an altitude of about 1,060 m.

The relationships of this species are not clear to me, as it is impossible to determine from the original description to which section the plant really belongs, while the material of the type collection before me shows neither the attachment of the inflorescence nor flowers. I found, however, a single petal, which appears to me to have been free, and have accordingly placed the species in the section *Heteranthus;* for the sake of convenience I have included it in the key, also in the section *Dendrophthoë*.

In vegetative characters the type collection is rather closely matched by a specimen from Zamboanga, Mindanao, *Ahern 579*, with very immature flowers, and one from Mount Mayon, Luzon, *Bur. Sci. 6482 Robinson*, with fruit only.

Both of these have opposite sessile leaves similar in size, shape, and texture to *Elmer 9525*, but on both the inflorescence is composed of very shortly peduncled, fascicled triads, while Mr. Elmer distinctly states that the flowers on his species are in small, axillary, sessile clusters.

Endemic.

§ CICHLANTHUS.

17. **Loranthus estipitatus** Stapf in Trans. Linn. Soc. Bot. II 4 (1894) 221; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26 (1894) 405.

PHILIPPINES, without locality, *Cuming 1970*. LUZON, Province of Tayabas, *Elmer 7911:* Province of Rizal, Bosoboso, *Merrill 1826*.

Southern China to Tonkin, Perak, and Borneo.

18. **Loranthus sphenoideus** Blume Fl. Jav. Loranth. (1828) 23, *t. 4;* Vid. Phan. Cuming. Philip. (1885) 140, Rev. Pl. Vasc. Filip. (1886) 231; F.-Vill. Nov. App. (1883) 184.

PHILIPPINES, without locality, *Cuming 490*. LUZON, Province of Benguet, *For. Bur. 4880, 10903 Curran, Williams 984:* Province of Zambales, *For. Bur. 5928 Curran:* Province of Bulacan, *Yoder 201:* Province of Rizal, *Bur. Sci. 110 Foxworthy*. MINDORO, *For. Bur. 8792 Merritt*. GUIMARAS, *For. Bur. 249 Gammill*. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 459*.

A form in many respects resembling *Loranthus fuscus* Blume, differing chiefly from the above specimens by its narrower leaves and paler pubescence, but which I am not disposed to consider specifically distinct from *Loranthus sphenoideus* Blume, is represented by the following specimens: PHILIPPINES, without locality, *Cuming 1959*. LUZON, Province of Union, Bauang, *Elmer 5711:* Province of Tarlac, *Merrill s. n.:* Province of Pangasinan, *Bur. Sci. 4977 Ramos; Alberto 35*.

Miquel has reduced *Loranthus sphenoideus* Blume to *L. repandus* Blume, as a variety, to which it is undoubtedly allied. The type of *L. sphenoideus* was from Celebes, and Blume reports the species from Java; I am not sure of its other distribution, but it is probably more or less widely distributed in the Malay region.

19. **Loranthus philippensis** Cham. & Schlecht. in Linnaea 3 (1828) 204; Blanco Fl. Filip. ed. 2 (1845) 164; A. Gray Bot. Wilkes U. S. Explor. Exped. (1854) 741; Vid. Phan. Cuming. Philip. (1885) 140, Rev. Pl. Vasc. Filip. (1886) 231; Merr. in Philip. Journ. Sci. 3 (1908) Bot. 84; F.-Vill. Nov. App. (1883) 183.

Scurrula philippensis G. Don Gen. Hist. 3 (1834) 423.

Dendrophthoë philippensis Miq. Fl. Ind. Bat. 1^1 (1856) 817; Vid. Cat. Pl. Prov. Manila (1880) 40.

Lonicera symphoricarpos Blanco Fl. Filip. (1837) 161.

Cichlanthus philippensis Van Tiegh. in Bull. Soc. Bot. France 42 (1895) 243.

PHILIPPINES, without locality, *Cuming 491, 1977*. LUZON, Province of Benguet, *Elmer 5911, Williams 1379:* Province of Nueva Vizcaya, *For. Bur. 15783 Curran & Merritt:* Province of Rizal, *Bur. Sci. 128 Foxworthy, Merrill 1688, For. Bur. 3169 Ahern's collector:* Province of Bataan, *For. Bur. 5790 Curran, Merrill 1585:* Province of Laguna, *Bur. Sci. 6013 Robinson, Hallier s. n.:* Province of Bulacan, *Yoder 241:* Province of Pangasinan, *Bur. Sci. 4972 Ramos:* Province of Tayabas, *Whitford 590*. MINDORO, *For. Bur. 3684 Merritt, Whitford 1427*. TICAO, *For. Bur. 2532 Clark*. MINDANAO, *Mrs. Clemens s. n.*

A widely distributed endemic species, apparently the Philippine representative of *Loranthus scurrula* Linn., and certainly closely allied to it. Typical forms are very distinct from the preceding and the next, but it is frequently very difficult to distinguish some small forms from the former.

20. **Loranthus ferrugineus** Roxb. Fl. Ind. 2 (1824) 188; DC. Prodr. 4 (1830) 299; Hook. f. Fl. Brit. Ind. 5 (1886) 210; Usteri Beitr. Ken. Philip. Veg. (1905) 125.

PALAWAN, *Merrill 705; Bur. Sci. 203 Bermejos; Bur. Sci. 823 Foxworthy.*
Malay Peninsula to Java and Sumatra.

§ DENDROPHTHOË.

21. **Loranthus hallieri** sp. nov.

Glaber; foliis sessilibus, oppositis, ovatis, basi valde cordatis, apice acuminatis, usque ad 10 cm longis, coriaceis, 5- vel 7-plinerviis; floribus 5-meris, in racemis brevibus axillaribus fasciculatis dispositis.

Glabrous throughout, or the inflorescence very slightly pubescent. Branches terete, reddish-brown, not lenticellate. Leaves opposite, ovate, coriaceous, sessile, 7 to 10 cm long, 3 to 5.5 cm wide, dull and brown when dry, the base very strongly cordate and half surrounding the stems, the apex acuminate; nerves 5 to 7 from just above the base, ascending, curved, rather distinct, the reticulations obsolete or nearly so. Racemes fascicled, axillary, the rachis less than 1 cm long, the pedicels about 2 mm long. Calyx cylindric, 3 mm long, the limb slightly produced, truncate or obscurely toothed, each subtended by an ovate, concave, acute or acuminate, 1.5 mm long bracteole. Corolla somewhat curved, 3 to 3.5 cm long, in bud somewhat narrowed at both base and apex to a diameter of 1 mm, the median portion slightly inflated and 3 mm in diameter, the tube 1.5 to 1.8 mm long, the lobes 5, about 1.7 mm wide, the portions above the insertion of the stamens linear, 8 mm long, recurved. Filaments 4 mm long; anthers continuous, linear, 3 mm long.

BASILAN, *Hallier s. n.*, February, 1904.
A species at once recognizable by its opposite, sessile, strongly cordate leaves, and short, axillary, fascicled racemes.

22. **Loranthus clementis** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 185.
MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*, March, 1906.
Endemic.

23. **Loranthus copelandii** Merr. l. c. 186.
LUZON, Province of Benguet, Daklan to Kabayan, *Merrill 4407;* Mount Pulog, *For. Bur. 18176, 16232 Curran, Merritt, & Zschokke.*
Endemic.

24. **Loranthus loheri** sp. nov.

Loranthus curvatus Vid. Rev. Pl. Vasc. Filip. (1886) 230; Phan. Cuming. Philip. (1885) 141; F.-Vill. Nov. App. (1883) 184, non Blume.

Glaber, inflorescentiis exceptis; foliis alternis, petiolatis, coriaceis, oblongo-ellipticis vel anguste ovato-ellipticis, in sicco brunneis, opacis, basi acutis, apice obtusis vel late obtuse acuminatis, usque ad 10 cm longis, nervis utrinque 3, ascendentibus; floribus rubris, leviter curvatis, circiter 3 cm longis, 5-meris, in racemis simplicibus, solitariis, axillaribus dispositis.

Glabrous except the inflorescence. Branches terete, smooth, grayish- or reddish-brown. Leaves alternate, oblong-elliptic to narrowly ovate-elliptic, 4 to 10 cm long, 1.5 to 4.5 cm wide, the base acute or acuminate, the apex blunt or very obscurely blunt-acuminate, brown and dull when dry, thickly coriaceous, brittle; nerves three on each side of the midrib, ascending, the reticulations obsolete or nearly so; petioles about 1 cm long. Racemes axillary, solitary, simple, the rachis 3 cm long or less, the pedicels about 3 mm long. Calyx densely grayish-puberulent, 2.5 to 3 mm long, the limb produced, obscurely 5-toothed, each subtended by a broadly ovate, 2 mm long bracteole. Corolla red, somewhat curved, 3 to 3.3 cm long, in bud slightly inflated above the middle, the apex narrowed; lobes 5, linear, about 8 mm long and 1 mm wide. Filaments 4 mm long; anthers continuous, 2.5 mm long.

LUZON, Province of Rizal, San Francisco del Monte, *Loher 4481* (type): Province of Ilocos Norte, *Bur. Sci. 2288 Mearns:* without locality, *Cuming 1955, 1965,* and a sheet in the herbarium of this Bureau without number.

A species manifestly allied to *Loranthus curvatus* Blume, but with much smaller flowers.

25. **Loranthus pentandrus** Linn. Mant. (1767) 63; DC. Prodr. 4 (1830) 305; Blume Fl. Jav. Loranth. (1828) 33, *t. 10;* Hook. f. Fl. Brit. Ind. 5 (1886) 216; F.-Vill. Nov. App. (1883) 184.

PALAWAN, *Merrill 692, Bur. Sci. 283 Bermejos.*

India to the Malay Peninsula, Sumatra, Java, and Borneo.

26. **Loranthus subalternifolius** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 188, excl. syn. *Loranthus cumingii* Engl.

Amylotheca cumingii Van Tiegh. in Bull. Soc. Bot. France 41 (1894) 264.

Elytranthe cumingii Engl. Nat. Pflanzenfam. Nachtr. 1 (1897) 126.

PHILIPPINES, without locality, *Cuming 1969* (type number of *Amylotheca cumingii* Van Tiegh.). LUZON, Province of Benguet, *Elmer 6191.*

The original specific name is invalidated in *Loranthus* by *Loranthus cumingii* Engl. and *L. cumingianus* Engl.

Endemic.

27. **Loranthus boholensis** sp. nov.

Glaber; foliis oppositis, coriaceis, petiolatis, lanceolatis vel late lanceolatis, usque ad 15 cm longis, basi rotundatis vel abrupte decurrenti-acuminatis, apice gradatim acuminatis, nervis utrinque 3 vel 4, obscuris, curvato-ascendentibus; inflorescentiis axillaribus, solitariis vel fasciculatis, floribus omnibus sessilibus, tenuibus, 6-meris, falcatis, in triadibus breviter pedunculatis, racemose dispositis.

Glabrous throughout. Branches terete, grayish, lenticellate. Leaves opposite, lanceolate or broadly lanceolate, coriaceous, dark-colored or brown, and somewhat shining on the upper surface when dry, 11 to 15 cm long, 3 to 5 cm wide, broadest in the lower part, the base rounded or abruptly and slightly decurrent-acuminate, gradually narrowed upwards to the acuminate apex, which is straight or slightly falcate; nerves

3 or 4 on each side of the midrib, indistinct, curved-ascending; petioles 1 to 1.5 cm long. Inflorescence axillary, solitary or fascicled, rachis 2 cm long or less, the flowers all sessile, greenish-yellow, red at the base, secund, arranged in triads which are very shortly peduncled, the triads racemosely arranged, their peduncles 2 to 2.5 mm long. Calyx cylindric, 2 to 2.5 mm long, each subtended by an ovate, 1.4 mm long bract. Corolla very slender, 6-cleft, about 2.5 cm long, 1.5 mm in diameter, the tube 4 to 5 mm long. Filaments 3 mm long; anthers continuous, 3.5 mm long.

BOHOL, Tagbilaran, parasitic on trees near the seashore, *Bur. Sci. 1277 McGregor*, July 12, 1906.

Allied to the preceding and to the next species, but characterized by its very slender and elongated flowers and its lanceolate, petioled leaves.

28. **Loranthus secundiflorus** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 187.

MINDANAO, Province of Surigao, Surigao, *Bolster 237*, February, 1906, and without number, May–June, 1906: Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*, March, 1906: District of Davao, *Williams 2695*.

Endemic.

29. **Loranthus mindanaensis** Merr. l. c. 186.

MINDANAO, District of Davao, *Copeland 341*, *DeVore & Hoover 285*, *Williams 2580*. Specimens from Guimaras, *For. Bur. 101 Gammill*, and from Negros, *Whitford 1489*, are probably referable here, differing from the type in some minor characters.

Endemic.

The above four species form a group of closely allied forms which are often difficult to distinguish. Additional material may lead to the reduction of some of them.

30. **Loranthus revolutus** sp. nov.

Glaber; foliis oppositis, ellipticis vel oblongo-ellipticis, coriaceis, in sicco nitidis, usque ad 7 cm longis, petiolatis, apice late rotundatis vel obtusis, basi decurrenti-acuminatis, margine revolutis, nervis utrinque 4 ad 6, vix distinctis; inflorescentiis in ramis vetustioribus, solitariis, floribus 5-meris, in triadibus racemose dispositis, floribus lateralibus brevissime pedicellatis, intermedio sessile.

Glabrous throughout. Branches stout, gray, terete, the branchlets brownish, obscurely angled. Leaves opposite, elliptic to oblong-elliptic, thickly coriaceous, brown and somewhat shining when dry, 5 to 7 cm long, 2 to 3.5 cm wide, the margins rather strongly recurved, the apex broad, rounded or obtuse, the base decurrent-acuminate; nerves 4 to 6 on each side of the midrib, not distinct; petioles nearly 1 cm long. Inflorescence from the larger branches below the leaves, solitary, the rachis 2 to 2.5 cm long, flower-bearing only above the middle, the flowers arranged in triads, the middle one of each triad sessile, the two lateral ones very shortly (1 mm) pedicelled, the triads in turn racemosely disposed, the peduncles 2 to 3 mm long. Calyx cylindric, about 4 mm long, obscurely toothed. Corolla yellow, red at the tip, 2.5 cm long, 5-cleft

nearly to the base, the tube about 1 mm long, the lobes 1.8 mm wide, the reflexed portion above the insertion of the anthers 7 mm long. Filaments 2 mm long; anthers continuous, 4 mm long.

LUZON, Province of Zambales, Mount Tapulao, *Bur. Sci. 4785 Ramos, For. Bur. 8252 Curran & Merritt,* December, 1907, altitude 2,100 m.

31. **Loranthus ahernianus** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 184.
LUZON, Province of Rizal, Bosoboso, *For. Bur. 2140 Ahern's collector:* Province of Zambales, *Bur. Sci. 5115 Ramos.*
Endemic.

32. **Loranthus acuminatissimus** sp. nov.

Glaber; foliis oppositis, petiolatis, elliptico-lanceolatis vel late lanceolatis, usque ad 13 cm longis, coriaceis, nitidis, in sicco pallidis, apice valde caudato-acuminatis, basi acutis; floribus 6-meris, 3.5 ad 4 cm longis, in triadibus dispositis, lateralibus longe pedicellatis, intermedio sessile; triadibus racemose dispositis, longe pedunculatis.

Glabrous throughout. Branches terete, grayish, lenticellate, rather slender. Leaves rather pale and shining when dry, opposite, elliptic-lanceolate to broadly lanceolate, 8 to 13 cm long, 2 to 4.5 cm wide, the base acute, the apex strongly caudate-acuminate, the acumen straight or slightly falcate, blunt or acute; nerves 7 or 8 on each side of the midrib, evident on both surfaces but scarcely more distinct than are the secondary ones and reticulations; petioles 5 to 8 mm long. Inflorescence axillary, glabrous, solitary, in the uppermost axils only, the rachis 5 to 6 cm long, each subtended by three or four broadly triangular-ovate, 2 to 3 mm long bracts. Flowers in triads, the middle one sessile, subtended by a broadly ovate, sharply and abruptly acuminate bract, 4 mm long, the lateral ones with pedicels 9 to 10 mm long; the triads racemosely disposed, their peduncles about 1 cm long. Calyx cylindric, 4.5 mm long, the limb produced about 1 mm, truncate or minutely denticulate. Corolla-tube short, slightly inflated, about 4 mm in diameter, 2 to 3.5 mm long, the lobes 2 mm wide at the base, the portion above the insertion of the anthers about 18 mm long. Filaments 11 mm long; anthers continuous, 7 mm long.

LUZON, Province of Benguet, Baguio, *Bur. Sci. 5700 Ramos,* December, 1908.

Manifestly closely allied to the preceding species, differing chiefly in its entirely glabrous inflorescence and very strongly caudate-acuminate leaves.

33. **Loranthus ovatifolius** Merr. in Philip. Journ. Sci. 3 (1908) Bot. 133.
MINDANAO, along the seashore, but with no definite locality, *Mrs. Clemens 1195,* September, 1907.
Endemic.

34. **Loranthus halconensis** Merr. in Philip. Journ. Sci. 2 (1907) Bot. 271.
MINDORO, Alag River, *Merrill 5664,* November, 1906, parasitic on *Ficus minahassae* Miq., altitude about 100 m. LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16230 Curran, Merritt & Zochokke.*
Endemic.

35. **Loranthus haenkeanus** Presl ex Schultes Syst. 7 (1829) 113; DC. Prodr. 4 (1830) 304; Vid. Rev. Pl. Vasc. Filip. (1886) 231, Phan. Cuming. Philip. (1885) 140; F.-Vill. Nov. App. (1883) 184.

Loranthus malifolius Presl l. c.; DC. l. c.; Vid. l. cc., Sinopsis Atlas (1883) *t. 81, f. B.;* F.-Vill. l. c.; Naves in Blanco Fl. Filip. ed. 3, *pl. 459.*

Scurrula haenkeana et *S. malifolia* G. Don Gen. Hist. 3 (1834) 423.

Dendrophthoë heankeana et *D. malifolia* Miq. Fl. Ind. Bat. 1[1] (1856) 822.

Candollina haenkeana et *C. malifolia* Van Tiegh. in Bull. Soc. Bot. France 42 (1895) 269.

Candollina barthei Van Tiegh. l. c. ?

Loranthus barthei Engl. Nat. Pflanzenfam. Nachtr. 1 (1897) 129?

PHILIPPINES, without locality, *Cuming 1947, 1957.* LUZON, Province of Ilocos Sur, *For. Bur. 5657 Klemme:* Province of Benguet, *For. Bur. 15892 Bacani:* Province of Union, *Elmer 5537:* Province of Pangasinan, *For. Bur. 18032 Merritt:* Province of Tarlac, *Hall s. n.:* Province of Nueva Ecija, *Bur. Sci. 5271 McGregor:* Province of Pampanga, *Bur. Sci. 1929 Foxworthy:* Province of Bulacan, *Yoder 251:* Manila, *Lyon s. n.:* Province of Bataan, *Bur. Sci. 1618, 1894 Foxworthy, For. Bur. 90 Barnes.* MINDANAO, Lake Lanao, *Mrs. Clemens s. n.*

A very characteristic, but rather variable species. I have not seen the types of the two species described by Presl, based on Heanke's Philippine material, but the two have been distinguished by later authors by the erect and terminal inflorescence of *L. haenkeanus,* and the lateral and refracted inflorescence of *L. malifolius,* but these characters do not appear to me to be constant, and I can detect no other specific differences either in the material before me or in the original descriptions of the two species. The only description given by Van Tieghem for the third species, *Candollina barthei,* is "ombelle terminale et réfractée," and I suspect that it, too, is only a form of *L. haenkeanus* Presl. On most of the specimens above cited, including both numbers of Cuming's collection, 5- and 6-merous flowers are to be found in the same umbel.

Endemic.

36. **Loranthus curranii** sp. nov.

Glaber, inflorescentiis exceptis; foliis alternis vel suboppositis, petiolatis, coriaceis, oblongo-lanceolatis, usque ad 15 cm longis, basi rotundatis vel acutis, apice acutis vel breviter acute acuminatis, nervis utrinque circiter 7, supra distinctis, subtus subobsoletis; floribus 4-meris, circiter 3 cm longis, in triadibus dispositis, lateralibus breviter pedicellatis, intermedio sessile, triadibus umbellatim dispositis, pedunculis reflexis vel patulis, in ramis vetustioribus.

Glabrous except the inflorescence. Branches terete, light-gray or brownish, stout. Leaves alternate or subopposite, coriaceous, brown when dry and somewhat shining, oblong-lanceolate, 11 to 15 cm long, 4 to 5 cm wide, the base rounded or acute, the apex acute or shortly and sharply acuminate; nerves about 7 on each side of the midrib, nearly obsolete on the lower surface, on the upper rather distinct, anastomosing, curved, the reticulations lax; petioles 1 to 1.5 cm long, stout. Umbels solitary, the peduncles, pedicels and calyces densely ferruginous-puberulent, the corolla slightly so, the peduncles spreading or recurved, about 1 cm long, from the larger branches below the leaves, the flowers 4-merous, in crowded triads which are umbellately arranged, their peduncles 3 to 4

mm long, the middle flower of each triad sessile, the lateral ones with pedicels about 1.5 mm long. Calyx densely ferruginous-puberulent, 5 mm long, narrowly funnel-shaped, 4-toothed, each subtended by a bracteole about 2 mm long. Corolla 2.5 cm long, slightly ferruginous-puberulent, red, split down one side, the tube 2.5 mm long, the lobes above the insertion of the stamens about 6 mm long, 1.5 mm wide, reflexed, acute. Filament 3 mm long; anther continuous, nearly 3 mm long.

LUZON, Province of Benguet, Mount Tonglon, *For. Bur. 5035 Curran*, August, 1906, parasitic on *Podocarpus* at an altitude of about 2,250 m, (type); Mount Pulog, *For. Bur. 18143 Curran, Merritt, & Zschokke.*

A species manifestly allied to the preceding, but distinguished by its constantly 4-merous flowers.

37. **Loranthus viridis** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 189.

PHILIPPINES, without locality, *Cuming 1953.* LUZON, Province of Bataan, *For. Bur. 816, 1814, 2938 Borden, For. Bur. 6318 Curran.*

Endemic.

38. **Loranthus banahaensis** Elmer Leafl. Philip. Bot. 1 (1908) 288.

Glaber; foliis oppositis vel suboppositis, petiolatis, crasse coriaceis, obovatis vel subellipticis, circiter 10 cm longis, 5 cm latis, apice obtusis vel rotundatis, basi acutis vel subcuneatis, in sicco supra olivaceis, nitidis, subtus brunneis, nervis utrinque 5 ad 7, obscuris, anastomosantibus; petiolo crasso, 1 ad 2 cm longo; floribus 6-meris, sessilibus, fasciculatis, axillaribus; circiter 1.7 cm longis; antheris sessilibus, basifixis.

LUZON, Province of Tayabas, Mount Banajao, altitude 750 m, *Elmer 9115*, May, 1907, type number.

There is considerable doubt as to its alliances, due to discrepancies between the original description and the material distributed under the type number. The specimen before me has 6-merous flowers, and sessile, basifixed, not versatile anthers, but in other respects agrees closely with Mr. Elmer's description, and it seems to be quite evident that he was in error in ascribing 4-merous flowers and versatile anthers to *Loranthus banahaensis*, unless the species was based on a mixture, which my specimen does not show, and accordingly I have emended the diagnosis above. It is barely possible that *Loranthus banahaensis* should be referred to the section *Lepiostegeres*, as the fascicles of flowers are described as being surrounded by involucral bracts, although no measurements are given, and the buds are said to be covered with a calyptrate hood which soon falls off. The specimen before me shows only a single inflorescence, with opened flowers, and the "involucral bracts" are represented only by the small bracteoles subtending the flowers. It is entirely different from the only other Philippine species of the section *Lepiostegeres* known to me.

Endemic.

§ MACROSOLEN.

39. **Loranthus ampullaceus** Roxb. Fl. Ind. **2** (1820) 189; DC. Prodr. **4** (1830) 296; Hook. f. Fl. Brit. Ind. **5** (1886) 220; Forbes & Hemsl. in Journ. Linn. Soc. Bot. **26** (1894) 405; F.-Vill. Nov. App. (1883) 184; Vidal Phan. Cuming. Philip. (1885) 141.

Hillia longiflora Blanco Fl. Filip. (1837) 235; ed. 2 (1845) 165; ed. 3, **1**: 297.

Loranthus tomentosus Naves in Blanco Fl. Filip. ed. 3, *pl. 44*, non Blanco.

Loranthus formosus F.-Vill. Nov. App. (1883) 164, non Blume.

Loranthus globosus Vid. Phan. Cuming. Philip. (1886) 230, non Roxb.

Elytranthe ampullacea Engl. Nat. Pflanzenfam. 3[1] (1889) 188; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 50.

PHILIPPINES, without locality, *Cuming 1951, 1963.* LUZON, Province of Nueva Ecija, *For. Bur. 8459 Curran:*- Province of Zambales, *For. Bur. 6944 Curran:* Province of Bataan, *Whitford 86:* Province of Rizal, *Bur. Sci. 979 Ramos, For. Bur. 479 Ahern's collector.* PALAWAN, *For. Bur. 3581 Curran.*

India to southern China, and the Malay Peninsula, south to Celebes.

40. **Loranthus macgregorii** sp. nov.

Glaber; foliis oppositis, coriaceis, oblongis, rectis vel leviter falcatis, usque ad 10 cm longis, apice obtusis, basi acutis vel obtusis, sessilibus, nervis utrinque circiter 4, subobsoletis, ascendentibus; inflorescentiis axillaribus, solitariis vel binis; floribus sessilibus subcapitatis, 5-meris; corolla 16 mm longa.

Glabrous throughout. Branches gray or brown, terete, rather slender. Leaves opposite, sessile, oblong, 6 to 10 cm long, 2 to 3 cm wide, coriaceous, dull when dry, the apex blunt, the base acute or blunt; nerves about 4 on each side of the midrib, very slender and obscure, ascending. Flowers three to six at the apex of each peduncle, sessile, not in triads, subcapitately arranged, the peduncles about 5 mm long, solitary or two in each axil. Calyx cylindric, slightly enlarged upwards, 5 mm long, the limb slightly produced, truncate, each subtended by an ovate, obtuse, 2 mm long bract, and a wider bracteole of about the same length which is retuse, apparently formed of two connate bracteoles. Flowers 5-merous, yellow. Corolla 16 mm long, the buds angular, inflated below and slightly so at the apex, in anthesis about 5 mm in diameter below the middle, the tube about 5 mm long; lobes 4 mm wide at the base, narrowed to 1 mm in the median portion, the part above the insertion of the anthers reflexed, thick, fleshy, 5 mm long. Anthers sessile, 3.5 mm long. Style 14 mm long; stigma capitate.

BOHOL, Guindulman, *Bur. Sci. 1266 McGregor,* June, 1906.

A species well characterized by its sessile subcapitate flowers which are congested and sessile at the ends of the short peduncles, each subtended by two bracts.

41. **Loranthus geminatus** sp. nov.

Glaber; foliis oppositis, petiolatis, coriaceis, anguste ovatis vel ovato-lanceolatis, usque ad 10 cm longis, acutis vel acuminatis, nervis utrinque 5 ad 7, tenuibus, obscuris; inflorescentiis axillaribus, solitariis vel fasciculatis, floribus 6-meris, sessilibus, geminatis; corolla 1.5 cm longa.

Glabrous throughout. Branches dark-colored, terete, not lenticellate, the branchlets slightly compressed. Leaves coriaceous, very dark-brown or nearly black and slightly shining when dry, opposite, narrowly lanceolate to ovate-lanceolate, 8 to 10 cm long, 3.5 to 5 cm wide, the base acute, the apex acute or acuminate; nerves 5 to 7 on each side of the midrib, slender, curved, obscure; petioles 5 mm long. Peduncles axil-

lary one to three in each axil, about 4 mm long, each bearing at its apex two sessile flowers. Calyx 6 mm long, cylindric, the limb produced about 1.5 mm, somewhat spreading, obscurely toothed, each subtended by one broadly ovate, obtuse, 2.5 to 3 mm long bract, and a second similar one as long, but wider, which is retuse at the apex, apparently formed of two connate bracteoles. Corolla 1.5 cm long, inflated below, angled, in anthesis about 6 mm in diameter, narrowed to 3.5 mm at the apex, the tube 3 to 4 mm long, the lobes 6, 4 mm wide below, narrowed to 2 mm above, the reflexed portion above the insertion of the stamens 5 to 6 mm long. Filament about 2 mm long; anthers continuous, 3 mm long.

MINDANAO, Province of Surigao, Catel, *Merrill 5444*, October 5, 1906, parasitic on various shrubs along the river slightly above the influence of tide-water.

A species well characterized by its short, 2-flowered peduncles, the flowers sessile, 6-merous, each subtended by two bracteoles.

§ LEPIOSTEGERES.

42. **Loranthus congestiflorus** sp. nov.

Glaber; foliis oppositis, petiolatis, crasse coriaceis, oblongo-ovatis vel ovato-ellipticis, usque ad 9 cm longis, apice acutis, leviter acuminatis, vel obtusis, basi acutis, nervis utrinque circiter 4, obscuris, vel obsoletis; capitulis axillaribus terminalibusque, sessilibus, circiter 30-floris, bracteis 6 ad 10 arcte imbricatis involucratis, interioribus circiter 2.5 cm longis, exterioribus minoribus, deciduis; floribus brevissime pedicellatis, 6-meris, 3 cm longis.

Glabrous throughout. Branches stout, terete, gray, the younger ones smooth, reddish-brown. Leaves opposite, oblong-ovate to ovate-elliptic, 5 to 9 cm long, 2 to 3.5 cm wide, thickly coriaceous, brown or olivaceous when dry, dull or very slightly shining, the apex acute, slightly acuminate or obtuse, the base acute; nerves about 4 on each side of the midrib, very obscure or entirely wanting; petioles 0.5 to 1.5 cm long, stout. Inflorescence of sessile, axillary and terminal, many-flowered, globose heads, before anthesis entirely inclosed by 6 to 10, coriaceous, imbricated bracts, the inner ones at the time of anthesis elliptic-ovate, 2.5 cm long, the outer ones suborbicular, smaller, all coriaceous, brown, shining, deciduous; in immature specimens the bracts are much smaller, and the heads are globose, but with the increase in size of the heads, the bracts also increase in size. Flowers about 30 in each head, very shortly pedicelled, racemosely arranged on a very stout, short rachis. Calyx about 4 mm long, somewhat angled. Corolla 2.6 to 2.8 cm long, greenish-white to greenish-yellow, the tube about 3 mm long, the lobes 2 mm wide below, gradually narrowed upwards, the reflexed portion above the insertion of the anthers 8 mm long. Filaments 2 mm long; anthers continuous, 5 mm long.

LUZON, Province of Benguet, Mount Tonglon, *For. Bur. 5037 Curran*, August, 1906 (type), *For. Bur. 10833 Curran*, December, 1908, *For. Bur. 11093 Whitford*,

For. Bur. 14183 Merritt; Mount Pulog, *For. Bur. 18045, 18084 Curran, Merritt, & Zschokke;* Mount Ugo, *Bur. Sci. 5780 Ramos;* without locality, *Loher 4459.* MINDORO, Mount Halcon, *For. Bur. 4434 Merritt.* MINDANAO, Mount Malindang, *For. Bur. 4769 Mearns & Hutchinson.*

43. **Loranthus williamsii** sp. nov.

Glaber; foliis oppositis, petiolatis, oblongis vel oblongo-lanceolatis, obtusis, basi acutis, usque ad 7 cm longis, nervis lateralibus tenuibus, obscuris, utrinque 5 vel 6; capitulis axillaribus, solitariis, 4-floris, in alabastro globosis, bracteis circiter 6 arcte imbricatis involucratis, interioribus circiter 1.4 cm longis, exterioribus minoribus, deciduis; floribus sessilibus, 5- vel 6-meris, 3 cm longis.

Glabrous throughout. Branches terete, grayish-brown, rather densely lenticellate. Leaves opposite, coriaceous, dull-green when dry, not or but slightly shining, oblong to oblong-lanceolate, the apex obtuse, base acute, 5 to 7 cm long, 1.5 to 2.5 cm wide; nerves 5 or 6 on each side of the midrib, very slender, obscure; petioles about 3 mm long. Heads axillary, when young globose, solitary, sessile, surrounded by about 6 strongly imbricated, brown, shining, coriaceous, elliptic to elliptic-ovate, rounded deciduous bracts, the inner ones about 1.4 cm long, the outer gradually smaller, the outermost ones about 8 mm long. Flowers 5- and 6-merous, four in each head, sessile, the peduncle very stout, about 2 mm long, 3 mm in diameter, marked by the bract-scars. Calyx 2.5 mm long, about 3 mm in diameter, the limb produced, truncate. Corolla 27 mm long, the tube 3 to 4 mm in length, the lobes 5 or 6, 2 mm wide below, narrowed somewhat above, the reflexed portion above the insertion of the stamens 8 to 9 mm long. Anther sessile, linear, 7 mm long.

LUZON, Province of Benguet, Baguio, *Williams 973,* September 21, 1904. *Cuming 1974* is probably referable here but my specimen is too fragmentary for certain identification.

A species well characterized by its 4-flowered, sessile, axillary, solitary heads, the flowers sessile, 5- and 6-merous.

DOUBTFUL AND EXCLUDED SPECIES.

LORANTHUS BLANCOANUS F.-Vill. Nov. App. (1883) 355.

Brabejum ? caliculatum Blanco Fl. Filip. ed. 2 (1845) 39; ed. 3, 1: 72.

F.-Villar's species was based on Blanco's *Brabejum ? caliculatum,* but if the latter's description is correct in all particulars, the species can not be referred to the *Loranthaceae.* I have therefore excluded it, although I have not been able to make out the identity of *Brabejum ? caliculatum,* or to which family it really belongs.

LORANTHUS HETERANTHUS Wall.; Vid. Sinopsis Atlas (1883) *t. 81, f. A.*

Undoubtedly an erroneous identification, as the species has not been found in the Philippines; I can not determine to which species Vidal's figure really belongs.

DENDROPHTHOË INCARNATA Blume; Vid. Cat. Pl. Prov. Manila (1880) 40 (=*Loranthus incarnatus* Jack).

Undoubtedly an erroneous identification; the species has not as yet been found in the Philippines.

LORANTHUS RETUSUS Jack; F.-Vill. Nov. App. (1883) 184; Vidal Rev. Pl. Vasc. Filip. (1886) 232.

This species was credited to the Philippines by Vidal on the strength of a specimen in the Kew Herbarium, collected by Lobb, and so localized; however, there are two sheets of Lobb's collection at Kew, one labeled Philippines, and the other Java. It is a well known fact that Lobb's specimens were distributed with erroneous localizations, the same number in some herbaria bearing the locality "Philippine," in others "Singapore," and in others "Java." A number of species have been credited to the Philippines only on the strength of Lobb's specimens so labeled, which have not been discovered in the Archipelago by any later collectors, and which undoubtedly do not extend to the Philippines; among these are *Eurycoma longifolia Jack, Archytaea vahlii* Choisy, *Medinilla luzoniensis* Hook. f., *Leucopogon malayanus* Jack, *Embelia myrtillus* Kurz, *Fagraea ligustrina* Blume, and *Loranthus retusus* Jack. Until the above species are actually discovered in the Philippines, they should not be considered as representatives of the Philippine flora.

LORANTHUS SCURRULA Linn.; Schultes Syst. Veg. 7 (1829) 96.

Credited to the Philippines by citation of Camell, Luzon. n. 36. The species has not been found in the Archipelago, and Camell's plant was undoubtedly the allied *Loranthus philippensis* C. & S.

LORANTHUS PAUCIFLORUS Blanco Fl. Filip. (1837) 235; F.-Vill. Nov. App. (1883) 184, non Sw.

Loranthus tomentosus Blanco l. c. ed. 2 (1845) 164; ed. 3, 1: 296, non Heyne.

I have not been able to find any specimens that agree exactly with Blanco's description, which is not sufficiently complete to make out the relationships of the species. The description calls for a plant with opposite, nearly lanceolate leaves, obtuse at the apex, the margins and both surfaces stellate-pubescent or tomentose. Flowers 6-merous, three or four grouped in each axil. The only Philippine specimens that agree with the above in vegetative characters are forms of *L. philippensis* and *L. sphenoideus,* but neither of these has 6-merous flowers. It is barely possible that Blanco's description was based on a mixture of material. F.-Villar considered it to be a distinct valid species, and retained it under Blanco's first specific name. Neither name is valid, and as the species is a very doubtful one I do not consider it advisable to coin a new name for it at this time.

LORANTHUS COCCINEUS Jack.

LORANTHUS WALLICHIANUS Schult.

LORANTHUS PULCHER DC.

LORANTHUS FASCICULATUS Bl.

LORANTHUS FUSCUS Bl.

LORANTHUS BICOLOR Roxb.

LORANTHUS GLOBOSUS Roxb.

LORANTHUS PALLENS Wall.

LORANTHUS CARINATULUS Wall.

LORANTHS SPHAEROCARPUS Bl.

The above ten species were credited to the Philippines by F.-Villar in the Novissima Appendix to the third edition of Blanco's Flora de Filipinas (1883) 183, 184. It is very doubtful if any of them actually occur in the Philippines, and they were apparently credited to the Archipelago on the part of F.-Villar by misconceptions of the species and erroneous identifications.

2. **CLEISTOLORANTHUS** gen. nov.

Differt Lorantho corollae tubo apice corollae limborum interioribus partibus coalitis clauso, corollae limborum exterioribus partibus 4, liberis, late triangulari-obovatis, brevibus, patulis, apice subtruncatis, irregulariter dentatis.

1. **Cleistoloranthus verticillatus** sp. nov.

Glaber; foliis verticillatis, quaternis, petiolatis, oblongo-lanceolatis, coriaceis, usque ad 8 cm longis, basi acutis, apice acuminatis, nervis utrinque 2, subobsoletis; inflorescentiis axillaribus, solitariis, floribus 4-meris, in triadibus paucis, umbellatim dispositis, lateralibus breviter pedicellatis, intermedio sessile; corolla cylindracea, 4.5 mm longa, apice clausa.

Glabrous throughout. Branches terete, brown or gray, slender, slightly lenticellate, shining. Leaves whorled, four at each node, oblong-lanceolate, coriaceous, slightly shining when dry, 4 to 8 cm long, 1 to 2.5 cm wide, the base acute, the apex acuminate, acumen blunt or acute; nerves about 2 on each side of the midrib, very obscure; petioles 3 to 7 cm long. Inflorescence axillary, solitary, of depauperate umbellately disposed triads, the common peduncle about 1.5 cm long, slender, bearing at its apex three or four umbellately disposed branches, each branch in turn bearing a single triad of flowers, the branches about 6 mm long, the middle flower of each triad sessile, the lateral ones with pedicels about 2 mm in length. Flowers pink or red, 4-merous, each subtended by a single, ovate, acuminate bract about 1.5 mm long. Calyx 2 mm long, somewhat narrowly ovoid, its limb obscurely 4-toothed, slightly produced. Corolla 4.5 mm long, cylindric, 1 mm in diameter, the throat closed by inward projections of the corolla-limb, which are united and form a conical body closing the top of the corolla-tube, the exterior part of the limb consisting of four short, broadly triangular-obovate lobes, 2 to 2.3 mm wide, 1 to 2 mm long, their apices truncate and irregularly toothed. Stamens 4, included; filaments inserted near the base of the corolla-tube, opposite the lobes, 2.5 mm long; anthers continuous, oblong, 2-celled, introrse, obtuse, 1.5 mm long. Ovary 1-celled; style 3 mm long; stigma minute. Fruit narrowly ellipsoid, 8 mm long, with a single seed.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16229 Curran, Merritt, & Zschokke*, January 5, 1909, on trees in hardwood forests at an altitude of about 2,500 m.

A peculiar plant, with the habit, vegetative and many floral characters of *Loranthus*, remarkable for its cleistogamous flowers, the throat of the corolla-tube being closed by a conical body formed of inward projecting and united portions of the limb. It differs from *Loranthus* also in its very short, broadly triangular-obovate, subtruncate and irregularly toothed, spreading corolla-lobes.

3. PHRYGILANTHUS Eichl.

1. **Phrygilanthus obtusifolius** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 189.

LUZON, Province of Bataan, Mount Mariveles, *Whitford 134, 1081*, May, 1904, February, 1905, *For. Bur. 1813 Borden*, September, 1904, *For. Bur. 6286 Curran*, February, 1907.

Endemic.

4. VISCUM Linn.

1. Branches leafy ..... 1. *V. orientale*
1. Branches leafless, terete or compressed.
   2. Branches terete or angled..... 2. *V. angulatum*
   2. Branches compressed.
      3. Internodes 1.5 to 6 cm long; plant diffuse, pendulous or spreading, dichotomously branched, 20 to 80 cm long..... 3. *V. articulatum*
      3. Internodes 2 or 3 to 15 mm long; plant erect, strict, less than 10 cm long. 4. *V. opuntia*

1. **Viscum orientale** Willd. Sp. Pl. 4 (1805) 224; DC. Prodr. 4 (1830) 278; Blume Fl. Jav. Loranth. (1828) *t. 24, 25;* Hook. f. Fl. Brit. Ind. 5 (1886) 224; Vid. Phan. Cuming. Philip. (1885) 141, Rev. Pl. Vasc. Filip. (1886) 232; F.-Vill. Nov. App. (1883) 184; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26 (1894) 408.

Fusanus ? parasitus Blanco Fl. Filip. ed. 2 (1845) 53; ed. 3, 1: 100.

Viscum monoicum Presl Epim. (1851) 251, non Roxb.

Viscum opuntioides Cav. Icon. 6 (1801) 3, in note, probably, non L.

PHILIPPINES, without locality, *Cuming 1948, 1950, 1954, 1961.* LUZON, Province of Nueva Ecija, *For. Bur. 8454 Curran:* Province of Bataan, Lamao, *For. Bur. 7230 Curran:* Province of Pangasinan, *Alberto 2.* LUBANG, *Merrill 961.* PALAWAN, *For. Bur. 3814 Curran.*

India and Ceylon to southern China, through Malaya to New Guinea and northern Australia.

2. **Viscum angulatum** Heyne ex DC. Prodr. 4 (1830) 283; Miq. Fl. Ind. Bat. 1[1] (1856) 806; Hook. f. Fl. Brit. Ind. 5 (1886) 225; F.-Vill. Nov. App. (1883) 184.

Viscum ramosissimum Wight Icon. *t. 1017.*

Viscum capense Llanos Fragm. (1851) 53; Fl. Filip. ed. 3, 4: 38, non Linn. f. fide F.-Villar.

Viscum oxycedri Llanos Mem. Ac. Cienc. Madr. 4 (1858) 501; Fl. Filip. l. c. 102, non DC., fide F.-Vill.

LUZON, Province of Zambales, *For. Bur. 6943 Curran*, May, 1907, parasitic on *Casuarina equisetifolia* Forst.

India to Java and northern Australia.

3. **Viscum articulatum** Burm. Fl. Ind. (1768) 311; DC. Prodr. 4 (1830) 284; Hook. f. Fl. Brit. Ind. 5 (1886) 226; F.-Vill. Nov. App. (1883) 185.

Viscum compressum Poir. in Lam. Encycl. Suppl. 2 (1812) 861; Blume Fl. Jav. Loranth. (1828) *t. 26.*

Viscum philippense Llanos Fragm. (1851) 53, Fl. Filip. ed. 3, 4: 38, fide F.-Villar.

Viscum falcatum Llanos in Mem. Ac. Cienc. Madr. 4 (1858) 501, Fl. Filip. l. c. 102, non Wall., fide F.-Villar.

LUZON, Province of Benguet, *Williams 1009, For. Bur. 15894 Bacani, For. Bur. 10923 Curran, For. Bur. 16243 Curran, Merritt, & Zschokke:* Province of Union,

Elmer 5554: Province of Zambales, *For. Bur. 11051 Zschokke:* Province of Pangasinan, *For. Bur. 8347 Curran & Merritt:* Province of Rizal, *Loher 4482:* Province of Bataan, *For. Bur. 7230 bis Curran.* MINDANAO, Lake Lanao, *Mrs. Clemens 564.*

India to Formosa, the Malay Peninsula and Archipelago.

4. **Viscum opuntia** Thunb. Fl. Jap. (1784) 64.

Viscum japonicum Thunb. in Trans. Linn. Soc. 3 (1794) 329; Hook. f. Fl. Brit. Ind. 5 (1886) 228.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16074 Curran, Merritt & Zschokke:* Province of Zambales, Mount Tapulao, *For. Bur. 8080 Curran & Merritt.*

India to Japan, south to Mauritius, Malaya, and Australia; not previously reported from the Philippines.

5. NOTOTHIXOS Oliver.

1. Inflorescence of simple spikes.
   2. Leaves 2 cm long or less ..... 1. *N. curranii*
   2. Leaves 4 to 5 cm long ..... 2. *N. sulphureus*
1. Inflorescence cymose ..... 3. *N. philippinensis*

1. **Notothixos curranii** sp. nov.

Ramulis foliis junioribus inflorescentiisque densissime pallide griseo-puberulis; foliis oppositis, petiolatis, ovato-lanceolatis vel elliptico-lanceolatis, 1.5 ad 2 cm longis, trinerviis, apice obtusis vel leviter obtuse acuminatis, basi acuminatis, supra glabris, nitidis, subtus dense pallide puberulis; floribus 4-meris, oppositis, in spicis simplicibus terminalibus axillaribusque solitariis dispositis.

Branches terete, dark-brown or nearly black, glabrous, the youngest branchlets, inflorescences and young leaves densely pale-grayish-puberulent. Leaves opposite, ovate-lanceolate to elliptic-lanceolate, 1.5 to 2 cm long, 8 to 10 mm wide, subcoriaceous, the apex obtuse or obscurely and broadly acuminate, base acuminate, margins entire, the upper surface glabrous, brown and shining when dry, the lower surface densely pale-grayish-puberulent; nerves 3, slender, extending from the base nearly to the apex, rather distinct on the upper surface, nearly obsolete beneath; petioles 3 to 4 mm long, puberulent. Spikes terminal and axillary, solitary, about 1 cm long. Flowers 4-merous, sessile, opposite, each subtended by a small, broadly ovate, obtuse bract less than 1 mm long. Perianth-lobes 4, ovate, acute, 0.5 mm long.

LUZON, Province of Bataan, Limay, *For. Bur. 12402 Merritt & Curran*, August, 1908.

Distinguished among the Philippine species by its small leaves and pale, scarcely yellow, and not glandular puberulence.

2. **Notothixos sulphureus** sp. nov.

Ramulis foliis junioribus inflorescentiisque densissime sulphureo-glanduloso-puberulis; foliis oppositis, petiolatis, late ovatis, vel late ellipticis, usque ad 5 cm longis, subcoriaceis, basi apiceque late rotundatis, supra glabris, subtus pallide glanduloso-puberulis nitidisque, trinerviis;

floribus 4-meris, verticillatis, in spicis simplicibus axillaribus terminalibusque solitariis, usque ad 3 cm longis dispositis.

Branches terete, brown, glabrous. Leaves opposite, broadly ovate or broadly elliptic, subcoriaceous, broad and rounded at both base and apex, 3 to 5 cm long, 2 to 3.5 cm wide, the younger leaves like the branchlets and inflorescence densely yellow-glandular-puberulent, the adult leaves glabrous and often shining on the upper surface, beneath densely pale-glandular-puberulent and somewhat shining; nerves 3 from the base, extending nearly to the apex, slender, not prominent, the reticulations very lax; petioles 3 to 5 mm long, ultimately glabrous. Spikes axillary and terminal, solitary, 3 cm long or less, the flowers 4-merous, sessile, whorled, each flower subtended by a small, ovate, acute, 1 mm long bract. Perianth-lobes narrowly ovate, acute, about 1 mm long.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9132 Whitford & Hutchinson*, January, 1908.

A species well characterized by its broadly ovate or broadly elliptic leaves which are rounded at both ends, and its simple spikes.

3. **Notothixos philippinensis** Elmer Leafl. Philip. Bot. 2 (1908) 471 (*philippinense*).

Ramulis foliisque junioribus inflorescentiisque densissime aureo-glanduloso-puberulis; foliis oppositis, petiolatis, subcoriaceis, supra glabris, subtus dense aureo- vel griseo-glanduloso-puberulis, ovatis, ovato-lanceolatis vel subellipticis, basi acutis vel obtusis, supra angustatis, apice acutis vel acuminatis, 4 ad 6 cm longis, circiter 2.5 cm latis, trinerviis; inflorescentiis axillaribus terminalibusque, cymosis, 2 ad 5 cm longis; floribus 4-meris, ad apices ramulorum subcapitato-congestis.

NEGROS, Cuernos Mountains, near Dumaguete, *Elmer 10114*, May, 1908, parasitic on *Canarium* at an altitude of about 300 m. Readily distinguished among the Philippine species by its cymose inflorescence.

The genus has three species in Australia, one in Ceylon, one in Penang, and the above three in the Philippines.

6. **GINALLOA** Korth.

1. **Ginalloa cumingiana** (Presl) F.-Vill. Nov. App. (1883) 185; Vid. Phan. Cuming. Philip. (1885) 141, Rev. Pl. Vasc. Filip. (1886) 232.

Viscum cumingianum Presl Epim. (1851) 255; Walp. Ann. 2: 729.

PHILIPPINES, without locality, *Cuming 1968*, type number.

Endemic.

Var. **angustifolia** var. nov.

Differt a typo foliis multo minoribus angustioribusque, 2 ad 4 cm longis, 2 ad 4 mm latis.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 16242 Curran, Merritt, & Zschokke*. NEGROS, Canlaon Volcano, *Bur. Sci. 1139 Banks*, June, 1906.

THE SCITAMINEÆ OF THE PHILIPPINE ISLANDS.

By H. N. RIDLEY.

(*Director, Botanic Garden, Singapore, Straits Settlements.*)

This account of the *Scitamineæ* of the Philippine Islands is based on the whole series of specimens in the herbarium of the Bureau of Science, Manila, kindly placed in my hands by Mr. Elmer D. Merrill, which contains a very fine series of specimens of this group collected by many botanists in different islands of the Archipelago, and also collections made by Mr. A. D. E. Elmer.

Among the earlier collectors in the Philippines were Haenke, Cuming, and Blanco. The first of these collected a good number of species which were described and figured by Presl in "Reliquiae Haenkeanae." The types of Presl's species I have not seen; nearly all have been re-collected, but one or two do not seem to have been met with again. Cuming seems to have obtained comparatively few species of the order. Blanco described a small number, chiefly cultivated species, in the first and second edition of his "Flora de Filipinas," some of which are figured by Naves in the third edition. Warburg also made extensive collections in the Archipelago, and several of the species described by K. Schumann in the "Pflanzenreich," based on material collected by the former, I have not been able to identify with any of the plants collected by the American botanists, and to complete this account I have had to copy Schumann's descriptions.

The area does not seem to be so rich in this group of plants as are the Malay Islands farther west, or the Malay Peninsula. The number of genera, twenty-one, is not quite so large and the number of species is much smaller than in the Malay Peninsula. Of the indigenous genera we have *Globba, Hedychium, Gastrochilus, Zingiber, Hornstedtia, Amomum, Plagiostachys, Alpinia,* and *Costus* in *Zingiberaceæ,* and *Phrynium, Phacelophrynium,* and *Donax* in *Marantaceæ,* with the endemic genera *Kolowratia, Leptosolena* and *Adelmeria* (*Zingiberaceæ*), and *Monophrynium* (*Marantaceæ*). Of the genera found in the Malay Peninsula and Archipelago, not yet met with in the Philippines, are *Odontychium, Camptandra, Haplochorema, Conamomum, Elettariopsis, Geostachys,*

Geocharis and *Lowia,* and, except as introduced plants, *Curcuma, Kaempferia* and *Phaeomeria.*

Some notes on the distribution of the sections of the genera represented may be of interest. It is noticeable that in the genus *Globba* nearly all the species are white-flowered with but few yellow, while in India and the Malay Peninsula yellow-flowered ones predominate. In Borneo yellow ones become rare and white preponderate, and this is further accentuated in the Philippines. *Hedychium* is a genus of two groups, the terrestrial ones whose headquarters is in India, and the epiphytic ones of the tropical forests from Sumatra and the Malay Peninsula to the Philippines. *H. coronarium,* the only terrestrial species in the Philippines, is widely distributed throughout the eastern islands, but perhaps only introduced from the west. *Zingiber* is one of the genera of which herbarium specimens, unless specially carefully prepared and selected, are generally unidentifiable. It is usually necessary to take the flowers from the water-saturated spike and dry them separately in the field, as they perish or become unrecognizable often before one reaches camp. It is therefore often difficult to get a clear idea of the number of species and their relationships when one has to deal with material dried roughly and without special preparation, such as is found in ordinary collections. *Hornstedtia* is abundant in the Malay Peninsula, and in Sumatra, Borneo and Java; it thins out towards New Guinea, and as yet but two species have been found in the Philippines. *Amomum* does not appear to be strongly represented, but as these plants are often not very free-flowered we shall probably get more species later as collecting goes on. Two of the species described by Schumann under the section *Bintalua* appear from the descriptions to be species of *Plagiostachys.*

Plagiostachys, a genus of but few known species, seems to be better represented here than elsewhere, as there appear to be three Philippine species. It ranges from the Malay Peninsula eastwards. *Costus,* typically an American genus, is represented by a few species in the East Indies, and in the Philippines by two, one widely distributed throughout the East, another endemic and allied to a Malayan species. *Alpinia* is the most strongly represented genus in the Philippines; it is a typical eastern Asiatic one, ranging to Japan and Polynesia, beyond the region of most of the tropical Asiatic genera.

The *Marantaceæ* all belong to Malayan genera and are all allied to species of the Malay Peninsula except the endemic genus *Monophrynium.* The *Cannaceæ* are represented only by introduced species. *Lowiaceæ* are absent. The *Musaceæ* are represented by the introduced *Ravenala madagascariensis,* some distinct species of *Musa,* and many forms of *Musa sapientum* Linn. and *M. paradisiaca* Linn. Material in this group has not as yet been collected by the American botanists, and there are no specimens in the collection sent to me.

Synopsis of the genera.

Genus.	Species of the Malay Peninsula.	Species of the Philippines.	Endemic in the Philippines.	Introduced into the Philippines.	Philippine species extending to other islands.
Globba	16	10	7	0	3
Hedychium	4	2	1	1	0
Kaempferia	2	1	0	1	0
Gastrochilus	18	1	1	0	0
Curcuma	4	2	0	2	0
Costus	4	2	1	0	1
Zingiber	11	5	4	0	1
Amomum	11	8	8	0	0
Hornstedtia	13	4	4	0	0
Phacomeria	4	1	0	1	0
Adelmeria[a]	0	2	2	0	0
Plagiostachys	2	3	3	0	0
Alpinia	18	16	15	0	1
Kolowratia[a]	0	2	2	0	0
Leptosolena[a]	0	2	2	0	0
Donax	3	1	0	0	1
Phrynium	3	1	1	0	0
Phacelophrynium	1	2	2	0	0
Monophrynium[a]	0	3	3	0	0
Total	114	68	56	5	7

[a] Genera endemic in the Philippines.

SCITAMINEÆ.

§ 1. ZINGIBERACEÆ. Aromatic plants. Fertile stamen one, 2-celled.

Staminodes 2, broad and petaloid.

Spike or panicle terminal on a leafy stem.

Filament long, slender, exceeding the corolla.

Lip adnate to the filament above the corolla ..... 1. *Globba*

Lip free ..... 2. *Hedychium*

Filament shorter than the corolla, broad.

Anther-cells on a broad thin connective ..... 3. *Kaempferia*

Anther-cells thick, fleshy ..... 4. *Gastrochilus*

Spike radical, cone-like ..... 5. *Curcuma*

Staminodes small or absent.

Leafy stems not spiral; ligule oblong.

Spikes radical.

Anther with a long, curved beak ..... 6. *Zingiber*

Anther with two curved arms; lip broad ..... 7. *Amomum*

Anther crestless; lip narrow.

Spike obconic or cylindric ..... 8. *Hornstedtia*

Spike on a tall peduncle, hemispheric ..... 9. *Phaeomeria*

Spikes lateral from a leafy stem ..... 10. *Plagiostachys*

Inflorescence terminal on the leafy stem.

Inflorescence dense, subglobose, with large bracts ..... 11. *Adelmeria*

Inflorescence lax, or of several spikes.

Corolla-tube long, slender ..... 12. *Leptosolena*

Corolla-tube short, thick.
Panicle-branches spicate, with close-set bracts..... 13. *Kolowratia*
Panicle-branches lax, the bracts small, caducous..... 14. *Alpinia*
Leafy stem spiral; ligule annular; spike terminal or radical..... 15. *Costus*
§ 2. MARANTACEÆ. Non-aromatic. Fertile stamen one, with a single cell on the edge, the three others petaloid, irregular.
Stems erect, shrubby, branched..... 16. *Donax*
Stemless plants.
Inflorescence panicled, from the side of a petiole, spikes elongate.
17. *Phacelophrynium*
Spikes in a dense lateral head..... 18. *Phrynium*
Spikes in small heads; flowers solitary in the bracts..... 19. *Monophrynium*
§3. CANNACEÆ. Non-aromatic. Panicle terminal. Stamens regular, petaloid, one with a lateral anther-cell..... 20. *Canna*
§ 4. MUSACEÆ. Stamens five, non-petaloid; petals and sepals each connate into one organ ..... 21. *Musa*

1. GLOBBA L.

Slender herbs with a short rhizome. Leaves ovate or lanceolate, thin, sheathing, with a small ligule. Inflorescence terminal, panicled, lax. Flowers small, yellow, white, or violet. Calyx tubular, 3-toothed, regular or irregular. Corolla-tube longer, 3-lobed, lobes boat-shaped, deflexed. Staminodes similar. Lip-base adnate by its edges to the stamen, forming a tube, the limb narrow, deflexed, usually bilobed, rarely entire, the filament much longer, erect, slender. Anther small; connective prolonged laterally into a simple margin, or with two to four triangular spurs. Style longer, slender; stigma very small, cup-shaped. Ovary 1-celled, the placentas 3, parietal. Capsule globose, smooth or warted, succulent, dehiscing irregularly. Seeds small, with a white aril.

Species about 80, extending from India to Siam, southern China, and the Malay Peninsula and Archipelago.

§ CERATANTHERA. Anther-spurs one on each side.
Flowers yellow.
A tall stout plant, the panicle pyramidal..... 1. *G. pyramidata*
A weak small plant, the panicle slender..... 2. *G. parviflora*
Flowers white.
Leaves glabrous.
Anther-spurs linear, acuminate ..... 3. *G. campsophylla*
Anther-spurs triangular.
Calyx turbinate ..... 4. *G. brevifolia*
Calyx cylindrical ..... 5. *G. Merrillii*
Leaves pubescent beneath.
Sheaths pubescent.
Staminodes lanceolate, acute ..... 6. *G. gracilis*
Staminodes oblong, blunt ..... 7. *G. latifolia*
Sheaths glabrous ..... 8. *G. leucocarpa*
§ MARANTELLA. Anther-spurs two on each side.
Flowers yellow ..... 9. *G. marantina*
Flowers black or violet ..... 10. *G. ustulata*

1. **G. pyramidata** Gagnepain in Bull. Soc. Bot. France IV 1 (1901) 204, *pl. 4, f. 7–10;* K. Schum. in Pflanzenreich 20 (1904) 146.

A tall plant 70 to 90 cm tall, glabrous. Lower sheaths narrow, obtuse, apiculate. Leaves linear-lanceolate or lanceolate, attenuate-acuminate, with a long tail, the base acute, glabrous except for the tip, sometimes ciliolate and hairy, 10 to 25 cm long, 1.5 to 3.5 cm wide; ligule 2 mm long, truncate, glabrous. Panicle pyramidal, somewhat nodding, 8 to 10 cm long. Flowers yellow, sessile and on peduncles 2 to 3 cm long. Calyx shortly toothed, 4 mm long, turbinate. Corolla-tube 1.2 to 1.3 cm long. Staminodes lanceolate, acute. Lip short, broad, shortly bilobed. Anther with two short lunulate wings.

BUNUAN ISLAND, near Mindanao (*Montano 203*[1]), in Herb. Mus. Paris. Also found in Cambodia.

The figure resembles *G. Merrillii*, but that species has white, not yellow flowers.

2. **G. parviflora** Presl Rel. Haenk. 1 (1827) 115; K. Schum. in Engl. Bot. Jahrb. 27 (1899) 330; Pflanzenreich l. c. 146.

Stem slender, about 40 cm tall. Leaves linear-lanceolate, acuminate, attenuate, the base acute or rounded, glabrous, 30 cm long, 2 to 3 cm wide. Panicle weak and lax, 8 to 9 cm long, the branches few, slender, the lower ones 3 cm long. Bracts linear-oblong, obtuse, 1 to 3 mm long, persistent. Calyx funnel-shaped, 3-toothed, one tooth blunt, the other two mucronate. Corolla-tube slender, thrice as long, the lobes oblong, 4 mm long, concave, yellow. Staminodes widely linear-lanceolate, acuminate, a little longer. Lip subcuneate, bilobed, 5 mm long. Anther-spurs rising from a little above the base, subulate, curved.

LUZON, Province of Sorsogon, (*Haenke*): Province of Albay, Mount Mayon, *Bur. Sci. 2910 Mearns:* Province of Tayabas, Sampaloc, (*Warburg*): Province of Rizal, Bosoboso, *Merrill 2782, 2783.*

A small weak plant remarkable for its yellow flowers. It has a tendency to have all the flowers secund, that is, turned upwards on one side. Endemic.

3. **G. campsophylla** K. Schum. in Pflanzenreich l. c. 145.

G. parviflora Vidal Phan. Cuming. Philip. (1885) 152; K. Schum. in Engl. Bot. Jahrb. 27 (1899) 330, non Presl.

A slender plant about 50 to 60 cm tall. Leaves narrowly lanceolate, acuminate, with a long point, glabrous, narrowed a little abruptly at the base and shortly petioled, 9 to 15 cm long, 1 to 2 cm wide; petiole about 3 mm long; ligule very short, rounded, truncate, quite glabrous. Panicle 9 cm long, lax, with slender branches 3 cm long. Bracts linear-oblong, rounded, glandular-dotted, 2 mm long. Flowers white, on short articulations. Calyx funnel-shaped, with three, equal, ovate lobes, keeled and shortly mucronate, glandular-dotted. Corolla-tube slender, three times as long as the calyx, the lobes oblong, the upper one hooded, all glandular-dotted. Staminodes linear, longer, obtuse, glandular-dotted and pubescent. Lip rather deeply bilobed, the lobes linear, obtuse, glandular-dotted. Anther strongly glandular-dotted on the back, the spurs linear, acuminate, curved, much longer than the anther. Fruit rather large,

[1] Specimens cited in parenthesis not seen.

globose or oblong, about 1 cm long, glandular-dotted. Seeds numerous, covered with a white silky pubescence, and with a finely cut aril at the base.

LUZON, Province of Nueva Ecija, *Cuming 1390:* Province of Cavite, Maragondong, *Merrill 4177:* Province of Bataan, Lamao River, *For. Bur. 1461 Ahern's collector:* Province of Rizal, Bosoboso, *Bur. Sci. 1110 Ramos:* Province of Bulacan, *For. Bur. 7208 Curran.* SAMAR, Catubig River, *Merrill 5207.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 417:* Province of Surigao, *Bolster 338:* District of Zamboanga, *Copeland s. n.:* District of Davao, Malita, *Copeland 662.*

Endemic.

4. **G. brevifolia** K. Schum. in Pflanzenreich l. c. 145.

G. parvifolia Presl var. *brevifolia* K. Schum. in Engl. Bot. Jahrb. **27** (1899) 330.

A slender plant with stems 10 to 20 cm long. Leaves four or five only, sessile or very shortly petioled, lanceolate or suboblong-lanceolate, rather long attenuate-acuminate, hardly caudate, the base rounded, sometimes subcordate, quite glabrous except for a few scattered hairs especially at the tip, 5 to 6 cm long, 1.3 to 2 cm wide; ligule very short, scarcely 0.5 mm long, ciliolate as is also the sheath. Panicle 4 to 6 cm long, lax. Lower bracts minute, scarcely 1 mm long, suborbicular, rounded at the tip, the upper ones twice as long, ovate or acuminate, persistent. Branches capillary, 1 to 2 cm long, glabrous. Flowers long-pedicelled. Bracteoles resembling the bracts, persistent. Ovary ellipsoid, 2 mm long, glabrous, smooth. Calyx turbinate, with three obtuse lobes. Corolla not described. Anther with a triangular wing on each side.

LUZON, Province of Zambales, near Palauig, (*Warburg 14066*), in Herb. Berol.

Endemic.

5. **G. Merrillii** Ridl. in Govt. Lab. Publ. (Philip.) **35** (1905) 83.

A rather stout plant with long woolly tufted roots, the stem 60 to 90 cm tall. Leaves broadly lanceolate, long and very gradually acuminate, 12 to 20 cm long, 3 to 6 cm wide, the base rounded, inequilateral; petiole 2 to 3 mm long; ligule very short, truncate; all glabrous, except occasionally the lower leaves which are pubescent at the base. Panicle lax, 15 cm long, with remote 2 cm long branches. Bracts lanceolate, acute, caducous. Flowers white. Calyx-tube cylindric, very shortly and equally toothed. Corolla-tube slender, more than twice as long as the calyx, the lobes oblong-obovate, glandular-dotted. Staminodes smaller. Lip linear-oblong, entire, rounded at the tip, spoon-shaped, short. Filament short and broad. Anther elliptic, the spurs elongate, triangular, longer than the anther.

LUZON, Province of Bataan, Mount Mariveles, *Merrill 3869, Whitford 481, Leiberg 6158, For. Bur. 1598 Borden.*

Endemic.

6. **G. gracilis** K. Schum. in Pflanzenreich l. c. 145.

Slender, stems 25 to 35 cm tall, the five lowest sheaths narrow, acute, pilose and ciliate. Leaves 7 or 8, sessile or very shortly (2 mm) petioled, lanceolate or suboblong-lanceolate, acuminate, not distinctly caudate, the upper surface papillose rather than pilose, beneath pilose, 3.5 to 9 cm long, 1.2 to 2.5 cm wide; ligule scarcely 1 mm long, truncate, pilose. Panicle 4.5 to 6.5 cm long, minutely pilose, the lower branches 3.5 cm long, with 4 or 5, rarely 6, flowers. Bracts very caducous. Bracteoles minute, 1 to 1.5 mm long, oblong-ovate, obtuse, caducous. Ovary glabrous, scarcely 1 mm long. Calyx 3 mm long, very shortly toothed. Corolla-tube very slender, 1.7 cm long, the lobes 3 mm long. Staminodes lanceolate, acute, 4 mm long. Lip 5 mm long, bilobed. Anther oblong, the spurs curved upwards, acuminate.

MINDANAO, District of Davao, Mount Dagatpan, (*Warburg 15480*), in forests, 300 to 1,000 m altitude: Province of Misamis, Mount Malindang, *For. Bur. 4572 Mearns & Hutchinson.* NEGROS, *Elmer 10033.*

Endemic.

7. **Globba latifolia** sp. nov.

Stem about 90 cm tall, the lower 30 cm covered with sheaths only, which are oblong, rounded at the tip, mucronate, pubescent. Leaves oblong-lanceolate, attenuate, acuminate, acute, not caudate, the base cuneate, the upper surface glabrous, the lower pubescent, 20 to 24 cm long, 3 to 4 cm wide; petiole very short; ligule short, rounded, ciliate; sheath strongly ribbed, the margins pubescent. Panicles 15 cm long, the branches spreading, remote, 3 to 4 cm long. Flowers sessile, white. Bracts caducous. Bracteoles ovate, acute, pallid, glandular-dotted. Calyx cylindric, slightly dilated upwards, the lobes equal, one-third the length of the calyx, oblong, obtuse, glandular-dotted. Corolla-tube twice as long as the calyx, rather thick, the lobes one-half as long as the tube, oblong, blunt. Staminodes very similar, obtuse, linear-oblong. Lip short, bifid to the base and with two elliptic-ovate rounded lobes, the adnate portion of the lip deeply grooved and with two very distinct processes at the upper angle. Filament slender, 1 cm long. Anther oblong, with a pair of falcate, acuminate, appendages rising from the center of the side and longer than the anther. Fruit elliptic, 1 cm long, smooth. Seeds numerous.

MINDANAO, District of Zamboanga, San Ramon, *Copeland s. n.*, Sax River, *Williams 2324.* MINDORO, Baco River, *Merrill 4064.*

Very distinct among the Philippine species on account of its broad leaves, short flowers and short, deeply lobed lip.

8. **G. leucocarpa** sp. nov.

Whole plant 1 m tall, the sheaths glabrous. Leaves elliptic-lanceolate or lanceolate, acuminate, hardly caudate, the base rounded or shortly

narrowed, the upper surface glabrous, the lower thickly and minutely pubescent, more hairy along the midrib, 13 cm long, 2 to 3 cm wide; petiole very short; ligule short, glabrous. Panicle lax, 11 cm long, with numerous, remote, slender, spreading, 4 cm long branches. Bracts caducous, linear-oblong, obtuse, 3 mm long. Flowers white, nearly sessile, on short articulations. Bracteoles lanceolate, obtuse. Calyx infundibuliform, with three, unequal, ovate lobes which are keeled and mucronate, glandular-dotted. Corolla-tube twice as long as the calyx, slender, the lobes reflexed, boat-shaped, the upper one hooded, mucronulate. Staminodes longer, linear, obtuse, thinner. Lip narrow, deeply bifid and with narrow blunt linear lobes. Anther-cells rather narrow, linear, the spurs lanceolate, acuminate, rather narrow, curved. Fruit white.

LUZON, Province of Benguet, Twin Peaks, *Elmer 6465*, on cliffs and stream banks. MINDORO, Baco River, *Merrill 1789, 4064a; McGregor 201*, in humid forests. LEYTE, Palo, *Elmer 7298*.

This species is distinguished by its quite glabrous sheaths and ligules, while the lower surface of the leaves is pubescent. It differs from *G. gracilis* K. Schum., not only in its glabrous sheaths, but also in its linear obtuse staminodes.

9. **G. marantina** Linn. Mant. **2** (1771) 170; Rosc. in Trans. Linn. Soc. **8** (1807) 356; Monan. Pl. (1828) *t. 111;* Smith. Exot. Bot. **2** (1804) 85, *t. 103;* Roxb. Fl. Ind. **1** (1820) 77; Miq. Fl. Ind. Bat. **3** (1857) 561; Baker in Hook. f. Fl. Brit. Ind. **6** (1890) 206; Presl Rel. Haenk. **1** (1827) 115; K. Schum. in Pflanzenreich l. c. 156.

G. ectobolus K. Schum. in Pflanzenreich l. c. 156.

G. Barthei Gagnepain in Bull. Soc. Bot. France IV **1** (1901) 208; K. Schum. l. c. 169.

G. heterobractea K. Schum. l. c. 159.

A stout or slender plant 30 to 45 cm tall, the basal sheaths more or less hairy, always ciliate on the edge. Leaves lanceolate to ovate or elliptic-ovate, acuminate, 15 cm long, 6 cm wide, the base cuneate, the upper surface glabrous, the lower hairy; petiole very short and hardly distinct; ligule very short, rounded, hairy, ciliate on the edge. Panicle dense, very shortly peduncled, 4 cm long, at first fusiform, later dilated and almost oblong, the rachis hairy. Bracts persistent, ovate, rounded, glandular-dotted, ciliate on the edge and often pubescent all over, the lowest ones 1 cm long and containing bulbils, frequently all the bracts bulbiferous and flowerless. Bulbils conic, acuminate, green, warty when dry, frequently produced also in the axils of the leaves. Flowers yellow, on short branches, unilateral. Floral bracts oblong, cuspidate, glandular-dotted. Ovary warted, glabrous. Calyx tubular, hardly dilated upward, 3-toothed, two teeth mucronulate, one shorter, lanceolate, not mucronulate, all glandular-dotted. Corolla-tube three times as long, glandular and subpubescent, the lobes ovate, minutely pubescent, glandular-dotted.

Staminodes similar but more elliptic. Lip short, oblong, cuneate, widely retuse, the terminal points obtuse. Filament fairly stout. Anther-spurs 4, triangular, acuminate, equal.

LUZON, Province of Cavite, Mendez Nuñez, *Bur. Sci. 1455 Mangubat;* Maragondong, *Merrill 4168:* Province of Rizal, San Mateo, *For. Bur. 1846, 3259 Ahern's collector;* Bosoboso, *Merrill 2844:* Province of Pampanga, Mount Arayat, (*Warburg 14069*, fide Schumann sub *G. heterobractea*), *Merrill 4232:* Province of Laguna, Jalajala, (*Meyen*, fide Schumann sub *G. ectobolus*): near Manila, (*Barthe*, fide Gagnepain sub *G. Barthei*): Province of Pangasinan, *Merrill 2874.* PANAY, San Jose, *Yoder 14.*

Amboina, Celebes, Batchian, New Guinea and the Bismarck Archipelago; also as a weed of cultivation in Penang, Singapore and Java.

It is quite impossible to break up this species into the various "species" founded by Schumann and Gagnepain. I can not find a reliable character in any of the Philippine plants that I have seen, which justifies separating specifically any of the forms. *G. ectobolus* Schum. has for its chief character the production of bulbils in the axils of the stem leaves, a character which I have also seen in typical *G. marantina* introduced by Javanese from Java into Penang. *G. Barthei* Gagnepain, which I take to be the typical Philippine form, has broader leaves and a stouter stem than has the form that occurs occasionally as a weed in the Straits Settlements.

There is a considerable degree of variability in the pubescence of the various parts of the specimens. In some, at least, short processes arise on the corolla-tube and lobes, hardly long enough to be called pubescence. I have long ago pointed out the valueless character of the production or nonproduction of bulbils, for I have hardly met with any *Globba* in any abundance which does not occasionally produce them. *G. marantina,* which was for many years a weed in the Botanic Gardens in Singapore, and of which Schumann says that he had never seen flowers, eventually produced a few flowers, although almost every plant produced bulbils only for a number of years. Probably *G. strobilifera* Zoll. (*G. Zollingeri* Gagnep.) of Java is the same species.

10. **G. ustulata** Gagnepain in Bull. Soc. Bot. France IV 1 (1901) 208, *pl. 7, f. 5–7;* K. Schum. in Pflanzenreich l. c. 158.

An herb 40 cm tall, with ciliate sheaths. Leaves lanceolate, acuminate, petioled, slightly pilose, velvety beneath, ciliolate, 15 cm long, 4 cm wide; ligule 1.5 to 2 mm long, the margins villous. Panicle sessile, dense, 5 cm long. Bracts orbicular or elliptic, 1.2 cm long, black at the tips, bulbiliferous. Flowers two or three together on a short peduncle, black or purple. Ovary smooth, glabrous. Calyx 7 mm long, 3-toothed, the teeth mucronate. Corolla-tube 1.2 to 1.4 cm long, upper lobe with a long mucro 1 mm long. Anther 4-spurred, spurs acuminate.

BUSUANGA, Calamianes Islands, (*Marche 227B*), in Herb. Mus. Paris.

Indo-China.

I should reduce this species also to *G. marantina* L. from the description, for I have seen no specimens, were it not for the statement that the flowers are black or purple, a most unusual, if not unique character in the genus, and for the mucronate upper petal.

2. HEDYCHIUM Koenig.

Terrestrial or epiphytic herbs. Stems elongate, leafy. Leaves oblong or lanceolate. Inflorescence a terminal spike. Bracts oblong or lanceolate, subcoriaceous. Flowers one or more to each bract, showy. Calyx tubular, 3-toothed. Corolla-tube long, slender, the lobes linear, spreading or reflexed. Staminodes linear. Filament long, slender; connective not prolonged. Lip large, bifid. Ovary 3-celled, many-ovuled. Style long, filiform; stigma small. Capsule globose or oblong, 3-valved. Seeds many, small, with a colored aril.

Species about 40, Indo-Malayan.

Terrestrial; flowers large, white ..... 1. *H. coronarium*
Epiphytic; flowers red ..... 2. *H. philippinense*

1. **H. coronarium** Koen. in Retz. Obs. **3** (1783) 73; Rosc. in Trans. Linn. Soc. **8** (1807) 343, *t. 20, f. 6;* Monandr. Pl. (1828) *t. 51;* Sims in Bot. Mag. *t. 708;* Smith Exot. Bot. **2** (1805) *t. 107;* Wight Icon. *t. 2010;* Horan. Monogr. (1862) 24; Baker in Hook. f. Fl. Brit. Ind. **6** (1892) 225; K. Schum. in Pflanzenreich **20** (1904) 44.

H. gandasulium, H. prophetae & *H. album* Ham. ex Wall. in Hook. Kew Journ. Bot. **5** (1853) 325.

H. lingulatum Hassk. Pl. Jav. Rar. (1848) 135; Horan. Monogr. (1862) 25.

Stems 1 to 2 m tall. Leaves oblong-lanceolate to lanceolate, acuminate, base acute, the upper surface glabrous, the lower pubescent or glabrous, 8 to 60 cm long, 3 to 11 cm wide; ligule 2 to 3 cm long, membranous, obtuse. Spike ellipsoid, 5 to 12 cm long, 4 to 8 cm thick. Bracts ovate, obtuse, green with a pale margin, 2- or 3-flowered, 4 to 5.5 cm long, 2 to 3 cm wide. Ovary silky, 5 mm long. Calyx tubular, cleft on one side, 4 cm long. Corolla white, the tube cylindric, 8 cm long, the lobes narrow, lanceolate. Lip obcordate or obovate, more or less deeply bilobed, white with a yellow median line. Staminodes broad, oblong-lanceolate, blunt, 4 cm long. Stamen shorter than or equaling the lip, 3.5 cm long, white; anther 12 mm long. Capsule oblong. Seed angled, with a lacerate aril.

SAMAR, Catubig, *Merrill 5226.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens* 77.

Probably a native of the Himalayan region but now spread as an alien or garden escape over most of the tropics.

2. **H. philippinense** K. Schum. in Pflanzenreich l. c. 47.

An epiphytic herb 0.5 to 1 m tall. Stems solitary or two or three in a cluster. Leaves lanceolate, petiolate, 23 to 45 cm long, 7 to 8 cm wide, glabrous, the apex acute, the base narrowed to the petiole, pale beneath; petiole about 2 cm long; ligule large, membranous, acute. Spike subterminal, cylindric, nearly sessile, 9 cm long, 2 cm thick. Bracts elliptic or lanceolate, subacute or obtuse, coriaceous, punctate, ribbed, closely imbricate, 1 to 1.5 cm wide, pubescent at the apex, the margins scarious. Bracteoles tubular, split on one side, pubescent. Flowers in threes, yellow. Ovary glabrous. Calyx tubular, slender, 4 to 6

cm long, pubescent, split on one side. Corolla-tube slender, twice as long as the calyx, the lobes linear, 3 cm long. Staminodes wider, linear-oblanceolate. Lip obovate, bilobed, 2 cm long, glandular-dotted, the margins crisped. Stamen as long as the lip. Capsule triquetrous, 3 cm long, orange-yellow. Seeds dark-red, elliptic, 5 mm long, ribbed, the aril fibrillose, red.

Sulu Archipelago, (*Vidal 3924*). Mindanao, Lake Lanao, Camp Keithley, *Mrs. Clemens 747*. Luzon, Province of Tayabas, Lucban, *Elmer 7909*.

Allied to *H. borneense* Ridl. Endemic.

3. KAEMPFERIA Linn.

Small herbs with tuberous aromatic rhizomes, the stems short. Leaves ovate or lanceolate. Inflorescence spicate, very shortly peduncled, with a few lanceolate bracts. Flowers fugacious, thin-textured, produced singly, white or violet. Calyx short, cylindric. Corolla-tube slender, the lobes narrow, linear. Staminodes very large, rounded, clawed, spreading. Lip similar, bilobed. Stamen thin, flat, not exserted; anther narrow, crested. Capsule oblong, thin-walled.

Species about 20, Indian and Siamese, one or two Malayan.

1. **K. galanga** Linn. Sp. Pl. (1753) 2; Hort. Cliff. 2 (1837) *t. 3;* Blume Enum. Pl. Jav. (1827) 47; Rosc. Monandr. Pl. (1828) *t. 92;* Roxb. As. Research. **11** (1810) 327; Fl. Ind. 1 (1820) 15; Wight. Icon. (1844) *t. 899;* Horan. Monog. (1862) 2; Baker in Hook. f. Brit. Ind. **6** (1890) 219; K. Schum. in Pflanzenreich **20** (1904) 77.

K. sessilis Koenig in Retz. Obs. **3** (1783) 67.

K. humilis Salisb. Prodr. (1796) 6.

K. plantaginifolia Salisb. in Trans. Hort. Soc. **1** (1812) 286.

Stemless, with a tuberous rhizome. Leaves two, horizontal, orbicular, subacute, the base rounded, 7 to 13 cm long, 4 to 9 cm wide. Flowers 6 to 12, fragrant, white. Bracts short, lanceolate, green. Calyx short. Corolla-tube 2.5 cm long, the lobes lanceolate. Staminodes cuneate, obovate, 1.2 cm long. Lip 2.5 cm long and nearly as wide, bilobed, the base spotted, violet, the rest white. Stamen thin, the crest quadrate, bilobed.

Luzon, Province of Rizal, Bosoboso, *Bur. Sci. 1181, 4560 Ramos:* Province of Cagayan, (*Cuming 1331*): Province of Tayabas, near Lucban, *Elmer 7408*. Native names, *Cusol, Guisol, Dusol, Dusog*.

A commonly cultivated plant of Indian origin, occurring all over the East as a garden escape.

4. GASTROCHILUS Wallich.

Low herbs with a creeping aromatic rhizome, the stems short or none. Leaves lanceolate or ovate, petioled, solitary or in tufts of from two to four. Spike axillary, central, or from the rhizome. Bracts large or of moderate size, thin. Flowers thin, opening singly, white, yellow, or red. Calyx tubular, spathaceous. Corolla-tube long, slender, the lobes oblong or lanceolate. Staminodes similar, petaloid. Lip oblong or obovate, saccate or convolute, entire or more or less lobed at the apex.

Stamen-filament thick, fleshy. Anther oblong, crest small, sometimes absent.

Species about 30, Indo-Malayan or Siamese.

G. longipetiolata sp. nov.

Rhizome not seen. Leaves two, elongate, linear-lanceolate, obtuse, thin, glabrous on the upper surface, beneath sparingly pubescent, 14 cm long, 2 cm wide, the keel elevated at the rounded base; petiole 5 to 9 cm long. Spike central, 4 cm long, subcylindric. Bracts lanceolate, acuminate, pubescent especially on the edges. Calyx spathaceous, short. Corolla-tube slender, 4 cm long, the lobes lanceolate, acute, 8 mm long. Lip a little longer, obovate, the margins crisped. Stamen half as long; anther linear, the crest long, oblong, apex rounded, ovate.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9110 Whitford & Hutchinson.*

The first representative of the genus recorded from the Philippines, only one specimen with a single flower seen. It belongs to the section *Mesantha,* and is allied to *G. longipes* King & Prain.

Species of this genus are comparatively seldom met with in flower in forests owing to the fugacity of their flowers, and these plants are seldom obtained by collectors of herbarium specimens. There are probably more species in the Philippines, but the only way to obtain satisfactory material is to bring in the living plants and cultivate them.

5. CURCUMA Linn.

Herbs with aromatic rhizomes and tuberous or fibrous roots. Leaves oblong or obovate, usually tufted, rarely solitary. Spikes peduncled, from the rhizome, with the leaves or not. Bracts persistent, forming a cone, usually brightly colored, the uppermost ones often empty, longer and of a different color. Flowers several in each bract, with several bracteoles, short-lived. Calyx short, cylindric, toothed. Corolla-tube broad, funnel-shaped, the lobes ovate or oblong. Stamen oblong, petaloid. Lip orbicular or obovate. Filament of stamen short, broad. Anther-cells parallel, sometimes spurred at the base, crested or not. Style filiform. Ovary 3-celled, many-ovuled. Capsule membranous, globose, 3-valved. Seeds arillate, ovoid or oblong.

Species about 35, India to Siam, Malaya, and Australia.

The greater part of the genus is Indian and Burmese, and of these species several have been widely distributed in the East in cultivation, and have there occasionally established themselves in and near villages, or persisted long after the villages have disappeared. Such are the species occurring in the Philippines.

1. **C. Zedoaria** Rosc. Monandr. Pl. (1828) *t. 109;* Horan. Monog. (1862) 23; Baker in Hook. f. Fl. Brit. Ind. **6** (1890) 210; K. Schum. Pflanzenreich **20** (1904) 110; Ridl. Mater. Fl. Malay. Penin. **2** (1907) 21.

C. Zerumbet Roxb. Pl. Coromandel **2** (1798) *t. 101;* As. Research. **11** (1810) 333; Fl. Ind. **1** (1820) 23.

C. longiflora Salisb. in Trans. Hort. Soc. **1** (1812) 285.

C. speciosa Link Enum. **1** (1821) 3.

Amomum Zerumbeth Koenig in Retz. Obs. **2** (1783) 55.

A. latifolium Lam. Encycl. **1** (1783) 134.

Rhizome large, fleshy, with oblong rounded tubers, orange-colored inside. Leaves in pairs, lanceolate, cuspidate, glabrous, thin, bright green, with usually a central purple-brown bar, 25 to 60 cm long, 8 to 15 cm wide. Scape from the rhizome, not from the leaf-tuft, often appearing without the leaves, the peduncle 15 cm long, the spike as long as the peduncle, of about 20 bracts, the lower ones green, more or less tipped with pink, the upper ones lanceolate, deep-crimson. Flowers four to each bract. Bracteoles thin, transparent, 2 cm long, lanceolate. Calyx small, bifid, hairy. Corolla-tube 2 cm long, funnel-shaped, yellowish-white, the lobes 1 cm long. Staminodes oblong, obtuse, erect. Lip oblong-obovate, bilobed, yellowish. Stamen-filament adnate to the staminodes, short, broad. Anther spurred. Capsule ovoid, trigonous, straw-colored, dehiscing irregularly. Seeds ellipsoid, the aril white, lacerate.

LUZON, Province of Rizal, Antipolo, *For. Bur. 7046 Curran;* Malapadnabato, *Merrill 2713:* Province of Bataan, Lamao River, *Whitford 1267, Leiberg 6142:* Province of Benguet, Sablan, *Elmer 6170:* Province of Zambales, *For. Bur. 6924 Curran:* Province of Pampanga, *Bolster 26.* NEGROS, *For. Bur. 11235 Everett.* GUIMARAS, *Ritchie 26.* MINDORO, Pola, *Merrill 2404;* Mansalay, *Merrill 908.* MINDANAO, Lake Lanao, *Mrs. Clemens 425.*

The zedoary is said to be wild in the eastern Himalayas, and is now spread all over the tropics of the East, being cultivated for curry stuff and as medicine. It readily establishes itself and remains long after the disappearance of the garden in which it was formerly cultivated.

Mr. Ritchie gives the native name *Lampoyang* for it. This word is the Malay one for *Zingiber Cassumunar* and is wrongly affixed to the zedoary.

2. **C. longa** Linn. Sp. Pl. (1753) 2; Koenig in Retz. Obs. **3** (1783) 71; Roxb. As. Research. **11** (1810) 340; Fl. Ind. **1** (1820) 32; Horan. Monog. (1862) 23; Lindl. Bot. Reg. *t. 88b;* Bentley & Trimen Med. Pl. *t. 269;* Baker in Hook. f. Fl. Brit. Ind. **6** (1890) 214; K. Schum. in Pflanzenreich l. c. 108.

C. domestica Lour. Fl. Cochinch. (1790) 10.

Amomum curcuma Jacq. Hort. Vindob. **3** (1776) *t. 4.*

Rhizome large, with elliptic or cylindric tubers, the interior deep-orange-red. Leaves 5 or 6, thin, lanceolate or oblong-elliptic, acuminate, cuspidate, glabrous, pale-green, 45 cm long, 12 to 18 cm wide; petiole channeled, 20 cm long. Spike 10 to 20 cm long, on a peduncle of about the same length. Bracts oblong to lanceolate, 2 to 3 cm long, spreading, recurved, pale-green, the terminal ones sometimes rosy. Calyx tubular, with three short points. Corolla-tube longer, the lobes oblong, obtuse, creamy-white. Lip oblong, the sides curved upward and the tip deflexed, apex truncate, white with a deep-yellow central bar. Staminodes as long as the petals. Stamen-filament broad; anther small, ovate, with two rather long decurved horn-like processes, the connective not prolonged.

PALAWAN, *For. Bur. 7457 Curran,* near the seashore.

The turmeric is a native of India, and here is obviously an escape from cultivation.

6. ZINGIBER Adans.

Herbs with short, thick, more or less aromatic rhizomes. Stems leafy, the leaves lanceolate or elliptic. Spike from the rhizome, rarely on the leafy stem, sessile or usually peduncled, cylindric, conic, or fusiform, with large, dense, yellow, red, or green bracts inclosing one or more flowers. Calyx tubular, three-lobed, short. Corolla-tube rather longer than the bract, with oblong or lanceolate lobes, usually white, or creamy, sometimes marbled black. Staminodes wanting. Lip 3-lobed, median lobe longer. Stamen-filament linear; anther-cells linear, the connective prolonged into a long curved beak. Style as long. Capsule thin-walled, splitting into three valves. Seed black, angled, arillate.

Species about 30, Indo-Malaya to northern Australia.

There are two or three species, perhaps more, in the material submitted, too incomplete to describe. These plants have the spikes so full of water that they require the flowers to be separately dried, or they quickly rot.

Spikes terminal on the leafy stem; bracts narrow, oblong ..... 1. *Z. mollis*
Spikes radical.
Spikes glabrous, cylindric, blunt ..... 2. *Z. Zerumbet*
Spikes pubescent, acute ..... 3. *Z. pubisquama*

1. **Z. mollis** sp. nov.

Stems solitary, slender, about 60 cm tall, the rhizome short. Leaves narrowly lanceolate, 12 to 15 cm long, 2 cm wide, acuminate, caudate, narrowed at the base, not petioled, the upper surface glabrous, beneath sprinkled with white hairs; ligule papery, rounded, entire, glabrous; sheath sparingly hairy. Spike terminal, cylindric, 6 cm long. Bracts yellow, narrowly oblong, apex rounded, 2 cm long and nearly 1 cm wide at the base. Bracteoles narrower, oblong, glandular-dotted on the edge. Ovary glabrous. Calyx thinly spathaceous, tubular, bifid into two lanceolate lobes, 2 cm long. Corolla-tube cylindric, 2.5 cm long, the lobes lanceolate, acuminate, acute, 1.5 cm long. Lip trilobed, rather large, the lateral lobes nearly as long as the middle one, which is entire and blunt. Stamen-connective beak-like, slender, curved. Capsule oblong, red, dehiscing, yellow inside. Seeds black.

LUZON, Province of Benguet, Baguio, *For. Bur. 4886, 4914 Curran;* Mount Tonglon, *Merrill 4843:* Province of Pampanga, Mount Abu, *Bur. Sci. 1985 Foxworthy,* altitude 1,330 m. NEGROS, *Elmer 9843.*

var. β. Leaves more elliptic in outline; ligule and sheath densely pubescent. Spike on a leafless peduncle from the rhizome. Peduncle 10 to 15 cm long, with distant tubular sheaths.

LUZON, Province of Tayabas, Mount Banajao, *Elmer 8133:* Province of Pampanga, Mount Abu, *Bur. Sci. 1991 Foxworthy.* One of the rarest gingers in this locality, growing in loose soil in shaded ravines at 700 meters, inflorescence red (Elmer); forested slopes in ravines at 1,360 meters (Foxworthy).

This ginger seems to be allied to *Z. officinale* as much as to any other species, and like it has the spike sometimes borne on the top of the leafy stem and also on the rhizome like the majority of the species of the genus.

2. **Z. Zerumbet** Sm. Exot. Bot. **2** (1804) 103, *t. 112;* Roscoe in Trans. Linn. Soc. **6** (1807) 348; Monandr. Pl. (1828) *t. 84;* Horan. Monogr. (1862) 27; Bot. Mag. *t. 2000;* Wight Icon. (1853) *t. 2002;* Baker in Hook. f. Fl. Brit. Ind. **6** (1890) 247; Ridl. Mater. Fl. Malay. Penin. **2** (1907) 27; K. Schum. in Pflanzenreich **20** (1904) 172.

Z. Blancoi Hassk. in Flora **47** (1864) 20.

Z. amaricans Blume Enum. Pl. Jav. **1** (1827) 43.

Z. spurium Koen. in Retz. Obs. **3** (1783) 60.

Z. ovoideum Blume l. c. 43.

Z. truncatum Stokes Bot. Mat. Med. **1** (1848) 68e.

Amomum Zerumbet Linn. Sp. Pl. (1753) 1; Jacq. Hort. Vindob. **3** (1776) *t. 54.*

A. spurium Gmel. Syst. **2** (1792) 6.

A. sylvestre Poir. in Lam. Encycl. Suppl. **5** (1817) 548.

Zerumbet zingiber Lestib. Ann. Sci. Nat. II **15** (1891) 329.

Amomum zingiber Naves in Blanco Fl. Filip. ed. 3, *pl. 131,* non Linn.

Rhizome thick, yellow, becoming white inside. Stems fairly stout, 30 to 45 cm tall. Leaves lanceolate, broad, glabrous except along the midrib which is hairy, 12 to 15 cm long, 5 to 7 cm wide; ligule papery, brown, 1 cm long. Spikes globose at first, becoming cylindric, blunt, as long or longer than the peduncle. Bracts broad, rounded, green turning red, the edges paler, hairy. Calyx spathaceous, 1 cm long, white. Corolla-tube twice as long, the lobes lanceolate, acute, white. Lip broad and short, the lateral lobes rounded, the middle one orbicular to ovate, retuse, pale-yellow and with an orange bar or faintly mottled with pink.

LUZON, Province of Bataan, Lamao River, *Whitford 1364, Leiberg 6089, Elmer 7028:* Province of Cavite, *Bur. Sci. 1454 Mangubat:* Manila, *Merrill 3440.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens.* Native names *Lumbong usa; Layang usa; Lampuyang.*

This is a widely distributed village plant all over the eastern islands; its original home seems to be unknown.

3. **Z. pubisquama** sp. nov.

Leafy stem tall and stout, 1 cm thick. Leaves narrowly lanceolate, acuminate, acute, the upper surface glabrous, finely ribbed, the back glabrous except the ribbed keel which is covered with pale hairs, 22 cm long, 3 to 4 cm wide; ligule very short, oblong, the edges ciliate; sheaths nearly glabrous. Inflorescence elongate, cylindric, acute, 14 to 15 cm long, 4 cm thick, on a stout peduncle 16 cm long, covered laxly with oblong sheaths 5 cm long, hairy, apex truncate. Bracts narrowly oblong, blunt, 3 cm long, 1.5 cm wide, closely appressed, hairy; inner bract linear-oblong, tip rounded, hairy, 3 cm long, 1 cm wide; floral bract thin, papery. Calyx thin, tubular, apex 3-lobed, 1.5 cm long. Corolla-tube slender, 3 cm long, glabrous, the lobes oblong, acute, hooded at the tip, 1 cm long, 3 mm wide. Lip broad, more fleshy. Anther narrowly oblong, the connective-beak 6 mm long. Style a little longer, cup-shaped.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1163a.*

Allied to *Z. Cassumunar* Roxb.

INCOMPLETE SPECIES.

4. **Z.** sp.

Leaves not seen. Spike stout, 30 cm long, 6 cm wide, cylindric, obtuse, the peduncle 7 cm long, covered with lax sheaths. Bracts large, oblong, narrowed a little at the base, the upper margin truncate, rounded, involute, 4 cm long, 2 cm wide, finely ribbed, glabrous. Bracteole tubular, spathaceous, the limb lanceolate, hairy, 4 cm long. Calyx thin, glabrous, tubular, apex rounded. Corolla-tube 2 cm long, the lobes as long, lanceolate, acute. Connective of the anther 1 cm long, grooved.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens.*

A fine species, allied to *Z. spectabile* Griff. Unfortunately no leaves were collected, nor was any description given of the habit or color, and I had only one poorly preserved flower to examine. The specimen is therefore insufficient for a proper description.

5. **Z.** sp.

Stem 2.4 m tall. Leaves lanceolate, petioled, the base narrowed gradually to the petiole, apex acute, 38 cm long, 7 cm wide, the petiole 2 cm long, glabrous; ligule large, 1 cm long, rounded. Spike subterminal on the leafy stem, deflexed, cylindric, 8 cm long, 3 cm thick. Bracts obovate, rounded, white, 1 cm wide, glabrous except for a few hairs on the edges, strongly ribbed.

LUZON, Province of Benguet, Sablan, *Elmer 6255*, very rare, on precipitous slopes in deeply shaded ravines.

There are no flowers on the specimen, which is therefore unidentifiable, but it is very distinct from any other Philippine species.

7. AMOMUM L.

Rhizome usually long. Leafy stems tall. Leaves lanceolate, oblong, or linear. Inflorescence obconic, or elongate, on a short peduncle from the rhizome. Bracts lanceolate or ovate, containing one or more flowers inclosed in thin bracteoles. Calyx as long as the corolla-tube. Corolla-lobes oblong or lanceolate. Staminodes absent or small. Lip large often convolute. Stamen broad, crest rounded, entire, or usually 3-lobed. Style shorter. Capsule globose or oblong, sometimes covered with short processes. Seeds numerous.

Species numerous, African and Indo-Malayan.

Anthers crested.
- Inflorescence elongate, slender ..... 1. *A. fusiforme*
- Inflorescence obconic, thick.
  - Anther-crest entire ..... 2. *A. Warburgii*
  - Anther-crest 3-lobed.
    - Staminodes absent ..... 3. *A. Loheri*
    - Staminodes present.
      - Lip entire.
        - Leaves broad ..... 4. *A. propinquum*
        - Leaves narrow ..... 5. *A. elegans*
      - Lip 3-lobed.
        - Middle lobe entire ..... 6. *A. deuteramomum*
        - Middle lobe bifid ..... 7. *A. trilobum*

Anthers crestless ..... 8. *A. lepicarpum*

1. **A. fusiforme** sp. nov.

Stem 1.5 m tall. Leaves narrowly elliptic, acuminate, cuspidate, the upper surface glabrous, beneath minutely velvety-pubescent, pale, glaucous on the lower surface, 30 cm long, 9 cm wide; petiole 1 cm long; ligule oblong, truncate, pubescent; sheath glabrous, ribbed. Spike basal, prostrate, slender, 15 to 45 cm long, the base with short ovate bracts. Flowers in pairs, in distant bracts which are hardly imbricate. Bracts linear-oblong, 5 cm long, ribbed and dotted between the ribs, obtuse. Bracteole spathaceous, 3 cm long, split on one side, and with two ciliate points. Calyx tubular, hairy, 3 cm long; lobes lanceolate. Corolla-tube short, lobes long, lanceolate, hooded at the tip. Lip bifid, with linear obtuse lobes, elongate but shorter than the stamen and adnate to the side of the filament. Filament short, thick, strongly winged. Anther 6 mm long, linear, hairy. Crest long, oblong, shortly trilobed at the base. Style as long as the anther-cells. Stigma triangular, hairy. Ovary elongate. Fruit fusiform, glabrous, ribbed, 4 cm long, 7 mm thick, terminated by the hairy 1 cm long style.

MINDANAO, Surigao, Biga Creek, *Bolster 331, 224*, in forests 150 to 350 ft. alt., flower yellow, or yellowish-white, native name "*Loya-loya.*" NEGROS, *Elmer 9509.*

Apparently allied to the genus *Geocharis*, but I am not sure about the lip for what I take to be the lip looks more like staminodes. Altogether a very curious plant which may prove to be the type of a new genus, here provisionally placed under *Amomum*.

2. **A. Warburgii** K. Schum. Pflanzenreich **20** (1904) 257.
Costus Warburgii K. Schum. in Engl. Bot. Jahrb. **27** (1899) 246.

Leaves oblong-lanceolate, attenuate-acuminate, the base narrowed but rounded and suboblique, glabrous on the upper surface except at the extreme base, subtomentose beneath, the midrib pilose, coriaceous, 20 to 25 cm long, 5 to 7 cm wide; ligule short, truncate, hardly 1 mm long; petiole subtomentose, about 1 mm long. Spike dense, short-peduncled. Bracts lanceolate, acute, subsilky, 1 to 8 cm long. Bracteoles tubular, silky, 2-toothed. Ovary silky. Calyx 4 cm long, deeply cleft on one side and with three subulate lobes. Corolla-tube one-third shorter than the calyx, the lobes spathulate, obtuse, 2 cm long. Lip obovate, 1.6 cm long. Filament oblong. Connective-crest truncate, a little wider than the anther, tomentose.

Southern Mindanao, (*Warburg*).

Endemic.

3. **A. Loheri** K. Schum. l. c. 247.

A fairly tall plant. Stems 5 mm in diameter. Leaves linear-lanceolate, attenuate-acuminate, the base narrowed, glabrous, 30 to 35 cm long, 3 to 4 cm wide; petiole 1 to 3 mm long; ligule 5 mm long, truncate, coriaceous. Spike ellipsoid, 3 to 5 cm long, the peduncle as long as the spike, white-pubescent, with a few ovate, glabrous, 0.8 to 1.2 cm long bracts, the outer ones soon disappearing. Bracteoles tubular, 2-lobed,

pilose. Flowers pedicelled, the pedicel 2 mm long. Ovary silky. Calyx tubular, 2-lobed, one lobe 2-toothed, minutely pubescent, 2 cm long. Corolla-tube hardly longer than the calyx, the lobes 2 cm long. Lip obovate, entire, 3 cm long. Staminodes none. Filament linear. Anther-cells pubescent. Connective-crest three-lobed.

LUZON, (*Loher 675*).

This endemic species, in habit and in many other characters, resembles *A. trilobum*, but differs, according to the description, by its entire lip and the absence of staminodes.

4. **A. propinquum** Ridl. in Govt. Lab. Publ. (Philip.) **35** (1905) 84.

Stems stout, about 2 m tall. Leaves oblong-lanceolate, acuminate, cuspidate, 32 cm long, 8 cm wide, glabrous, drying dark, paler beneath, the petiole very short; ligule oblong, truncate, 5 mm long. Capitulum obconic, on a 7 cm long peduncle. Floral bracts ovate-lanceolate, pubescent. Bracteole tubular, 1 cm long, pubescent, trifid, two lobes connate nearly to the tip. Calyx-tube 1 cm long, glabrous, trifid, the lobes mucronate, keeled, setulose. Corolla-tube trumpet-shaped, pubescent, the lobes oblong, obtuse, rounded, 1 cm long, yellow marked with red. Lip obovate, 2 cm wide, the central bar elevate-papillose. Anther oblong, the edges setose, the crest 3-lobed, upper lobe rounded, the lateral ones large, recurved, broadly oblong, obtuse. Filament thin, broadly linear. Staminodes very short, subulate. Fruit subglobose or elliptic, red, covered with short simple or forked processes.

LUZON, Province of Benguet, Baguio, *Elmer 6284, For. Bur. 5098 Curran;* Bugias, *Merrill 4656:* Province of Cavite, *For. Bur. 7682 Curran:* Province of Laguna, Mount Banajao, *For. Bur. 8030 Curran & Merritt:* Province of Tayabas, *For. Bur. 7828 Curran & Merritt.* MINDANAO, District of Davao, Todaya, *Copeland 1293.* MASBATE, *For. Bur. 1704 Clark.*

Native name *Tugis*, the fruit eaten. Endemic.

This species is allied to *Amomum flavum* Ridl. of the Malay Peninsula. Nearly all the specimens cited above have no leaf specimens with them, but on two or three distribution numbers fragments of *Hornstedtia philippinensis* were mixed with the *Amomum*, so much so that, abnormal as it appeared, I referred the fruit of the *Amomum* to the *Hornstedtia*. A better series of specimens showed that this was an error.

5. **A. elegans** Ridl. l. c. 84.

Rhizome long, slender, covered with brown papery sheaths 1 cm long. Stems slender, distant, 60 cm tall. Leaves narrowly linear-lanceolate, cuspidate, 15 to 20 cm long, 1 to 1.5 cm wide, the upper surface glabrous, beneath silky-hairy, shortly petioled; ligule small, truncate, the petiole, sheath and ligule hairy. Inflorescence obconic, 1 cm long, nearly sessile or distinctly stalked, on long stolons, covered with oblong-ovate, truncate sheaths. Bracts oblong, obtuse, pubescent, with about 10 elevated nerves. Bracteole tubular, silky-hairy. Calyx tubular, silky-hairy, 1 cm long, 2-lobed, the lobes lanceolate, acuminate, silky, as long

as the tube. Corolla yellow or white, the tube as long as the calyx, pubescent, the lobes linear-oblong, obtuse, glabrous, 1.5 cm long. Staminodes subulate. Lip 2 cm long, the base narrowed, the limb broad, obovate, rounded, entire. Stamen-filament slender. Anther narrowly oblong, the crest trifid, central lobe small, oblong, the lateral ones from the upper angle of the anther, longer, linear, curved. Ovary silky-hairy.

LUZON, Province of Bataan, Mount Mariveles, *For. Bur. 3303 Borden, Whitford 207, 300.*

6. **A. deuteramomum** K. Schum. in Engl. Bot. Jahrb. **27** (1899) 313; Pflanzenreich l. c. 237.

Leaves shortly petioled, linear-lanceolate, attenuate-acuminate, narrowed at the base, quite glabrous, 30 cm long, 3.5 cm wide; ligule hardly 5 mm long, obtuse, glabrous. Flowering stem 12 cm long. Spike ellipsoid, 8 cm long, the peduncle covered with ovate, obtuse, glabrous sheaths. Outer bracts ovate, acute, glabrous, pale straw-colored, 3 cm long. Bracteoles 1.5 cm long, tubular, glabrous, 3-toothed. Ovary pilose at the top. Calyx 1.3 cm long, tubular, 3-toothed, glabrous. Corolla-tube 10 mm long, the lobes obtuse, 8 mm long. Lip subovate, clawed, the apex 3-lobed, 10 mm long, the median portion callose and puberulous. Filament concave, 5 mm long. Anther shorter. Crest 3-lobed, 3 mm long. Stylodes 2, subulate.

MINDANAO, in forests near Bujong, (*Warburg 15735*).

Endemic.

Allied to *A. cardamon* Linn.

7. **A. trilobum** Ridl. l. c. 85.

Rhizome slender, long, covered with loose sheaths. Stems fairly stout, 1 to 2.5 m tall. Leaves narrowly lanceolate, caudate-acuminate, the base narrowed to the petiole, 20 cm long, 3 cm wide, glabrous; petiole 5 mm long; sheaths narrow, the edge and the short, bifid ligule silky-pubescent. Inflorescence on long creeping stolons, covered with sheaths, obconic, 2 cm long, on a 1 cm long peduncle. Bracts ovate, obtuse, ribbed, glabrous. Calyx tubular, pubescent, the lobes 3, oblong, rounded. Corolla-tube as long as the calyx-tube, 1 cm long, the lobes oblong-linear, obtuse. Staminodes linear, obtuse, fleshy. Lip obovate, rounded, 1 cm long, white with a central yellow bar, the tip undulate, 3-lobed, the lateral lobes rounded, the middle one bifid, narrowed. Stamen-filament linear, fleshy, grooved. Anther linear, glabrous. Crest 3-lobed, the middle one flat, quadrate, oblong, retuse, the two side arms linear, subacute, curved.

LUZON, Province of Pampanga, Mount Arayat, *Bolster 67:* Province of Bulacan, *For. Bur. 7218 Curran:* Province of Rizal, Bosoboso, *Bur. Sci. 4655 Ramos.*

On shaded slopes; flowers fragrant.

Endemic.

8. **A. lepicarpum** Ridl. in Elm. Leafl. Philip. Bot. **2** (1909) 604.

Stems 3 to 5 m tall, 3 cm in diameter at the bulbous base. Leaves about 12 to 14 cm apart, coriaceous, dark-olive-green, polished above, paler beneath, linear-oblong, base rounded, apex acute, 60 cm long, 10 cm wide, quite glabrous; petiole 2 cm long, channeled above, the back rounded; ligule 1 cm long, oblong, truncate. Inflorescence radical, on a 9 cm long peduncle, with rather distant, lanceolate, bracts. Bracts narrowly lanceolate, acuminate, ribbed, glabrous. Bracteoles narrowly lanceolate, acuminate, ribbed, 2.5 cm long, 4 mm wide, inner bracteole shorter, strongly ribbed, pungent-mucronate, all glabrous. Ovary sparingly pubescent. Calyx tubular, with three, lanceolate, mucronate-pungent lobes, the tube pubescent, 2 cm long. Corolla-tube a little longer, hairy, lobes linear-oblong, obtuse, 7 mm long. Lip entire, horizontal, linear, gradually dilated at the tip into a rounded, emarginate limb, 1 cm long, 5 mm wide. Anther linear-oblong, apex retuse, crestless. Inflorescence ovoid or subglobose, 8 cm long and about 6 cm thick. Fruit globose, reddish, 1.5 cm long, ferruginous-tomentose, with short, erect, scattered, warty processes at the tip, the calyx-tube long-persistent.

Negros, Cuernos Mountains, near Dumaguete, *Elmer 10044*, in wooded ravines on the edge of the river at an altitude of about 830 m. The form of the flowers is like that of a *Hornstedtia*, but the inflorescence, fruit, and bracts that of an *Amomum*.

Endemic.

A. lepicarpum var. **pubescens** Ridl. l. c. 605.

Leaves larger and more narrowed to the base, their margins distinctly undulate; sheaths and petioles pubescent. Bracts wider. Fruit more rufous-tomentose.

Negros, Cuernos Mountains, near Dumaguete, *Elmer 10384*, in moist fertile soil of dense shrubberies at an altitude of about 1,050 m; it may be a distinct species, but is very closely allied to the type. The flowers are in a bad state for dissection.

8. HORNSTEDTIA Retz.

Tall plants with a stout rhizome. Leaves oblong. Spikes peduncled, from the rhizome, subcylindric or obconic. Outer bracts large, usually red, ovate to oblong, forming a cup. Bracteoles thin, tubular. Flowers numerous, sessile, red. Calyx spathaceous, thin. Corolla-tube long, the lobes narrow, connivent. Lip narrow, linear-oblong, often much longer, sides at the base erect, curved over the stamen. Staminodes none. Stamen thick, short. Anther thick, bent at an angle with the filament, crest small or none. Capsule oblong, with thin cartilaginous walls. Seeds numerous, black.

About 40 known species ranging from India through the Malay Peninsula and Archipelago to northern Australia, headquarters in the Malay Peninsula and Borneo. I here separate from this genus as laid down in my Materials for a Flora of the Malay Peninsula 2 (1907) 34, the genus *Nicolaia* or *Phaeomeria*, as Schumann does.

1. **H. philippinensis** Ridl. in Govt. Lab. Publ. (Philip.) **35** (1905) 86.

Stems 2 m tall and fairly thick. Leaves oblong-lanceolate, caudate, glabrous, narrowed at the base, pale beneath, 45 cm long, 3 to 6 cm wide; petiole 1 to 2 cm long; ligule bilobed, oblong, obtuse, 1 cm long. Inflorescence borne on a long rhizome-branch 15 cm long, covered with lanceolate acute sheaths. Spikes 4 to 6 cm long on peduncles covered with sheaths 2 to 8 cm long. Bracts thin, lanceolate, ribbed, hairy at the tip, the largest about 2 cm long. Flowers scarlet. Bracteole oblong-lanceolate, strongly nerved, the margins ciliate. Calyx tubular, with three acute lobes 3 cm long. Corolla-tube 4 cm long, slender, the lobes narrow, linear-oblong, obtuse, 1 cm long. Lip 4 cm long, fleshy, linear-oblong, the apex dilated, rounded, entire. Stamen crestless, 1 cm long, the apex retuse.

LUZON, Province of Tayabas, *For. Bur. 11109 Curran.* MINDORO, Bongabong River, *For. Bur. 3737 Merritt.* PALAWAN, *Bur. Sci. 804 Foxworthy.* NEGROS, *For. Bur. 11203 Everett, Elmer 10270.* MINDANAO, Lake Lanao, *Mrs. Clemens 76:* District of Davao, *Copeland 416, DeVore & Hoover 111, Williams 2888:* Province of Surigao, *Bolster 221.*

By some mistake in several of the sheets, the fruits of *Amomum propinquum* were distributed as the fruit of this plant, hence my error in describing the fruit in the original description. The fruit of this species has not yet been collected. It belongs to the group to which Griffith gave the generic name *Achasma,* being allied to *H. megalocheila* Ridl.

Endemic.

2. **H. conoidea** Ridl. in Elm. Leafl. Philip. Bot. **2** (1909) 605.

Stems clustered, 3 m high, 3 cm in diameter at the swollen base. Leaves oblong-lanceolate, shortly cuspidate, base very shortly rounded, narrowed, 45 to 55 cm long, 8 to 14 cm wide, glabrous on the upper surface, beneath sprinkled with silky hairs which are more abundant on the midrib and margins; petiole very short (1 cm on some parts of the stem), pubescent; ligule truncate, densely hairy; sheath reticulate, sparingly hairy above. Spike subsessile, red, ovoid-conic, 7 to 8 cm long. Bracts ovate to ovate-lanceolate, acute, rather softly coriaceous, red, finely ribbed, and white-silky at the base, 4 cm long, 1.5 cm wide. Flowers 7.5 cm long. Calyx red, tubular, silky-hairy at the base, becoming glabrous upward, 5 cm long, split on one side, the lobes acute, tipped with hairs. Corolla red, tube 7 cm long, slender, the lobes oblong, obtuse, 1.5 cm long, rather narrow, the lip entire, fleshy, 2 cm long, blunt, margins white, upcurved. Anther hairy, with a thin, rounded, short crest.

NEGROS, Cuernos Mountains, near Dumaguete, *Elmer 10246,* in fertile soil in damp ravines at an altitude of about 600 m. Native name *Tagbac.* MINDANAO, Lake Lanao, *Mrs. Clemens,* July, 1906. Closely allied to *Hornstedtia conica* Ridl., of the Malay Peninsula, differing in its pubescent ligule and petiole.

Endemic.

3. **H. microcheila** Ridl. l. c. 606.

Stems from 1 to 3 m tall, several in a somewhat scattered cluster, recurved or drooping, yellowish-green, rigid, less than 1.5 cm thick, except the reddish, very much enlarged bulbous bases. Leaves subcoriaceous, linear-oblong, cuspidate, 20 to 24 cm long, 5 cm wide, glabrous on the upper surface, the midrib pubescent beneath, margins glabrous, reddish-brown; petiole 1 cm long, puberulous; ligule oblong, rounded, half as long as the petiole; sheath pubescent above, reticulate. Inflorescence small, ovoid, 4 cm long, on a peduncle about as long, which is covered with ovate, ribbed, pubescent bracts. Inflorescence-bracts few, ovate, the largest 3 cm long, 1.5 cm wide, coriaceous, ribbed, pubescent, red, mucronulate, the margins thinner, ciliate. Ovary glabrous, with a tuft of silky hairs at the top. Calyx tubular, 4 cm long, with a few silky hairs at the base, glabrous above except for the two acuminate lobes which bear tufts of hairs. Corolla pink, the tube 5 cm long, the upper lobe ovate-oblong, obtuse, 7 mm long, the lower ones narrower, linear-oblong. Lip creamy-white, 1 cm long, with two short narrow lobes, as long as the anther, base narrow, the sides upcurved and terminated by a rounded crisped limb; disk at base sparingly silky-hairy. Anther very short, glabrous, retuse at the tip. Stigma large, club-shaped.

Negros, Cuernos Mountains, near Dumaguete, *Elmer 10279*, near the river at an altitude of about 900 m. The smallest-flowered species of the section, and remarkable for its white lip, which is unusual in the genus.

Endemic.

4. **H. lophophora** Ridl. l. c. 607.

Stems 6 m tall, 3 cm thick, the bulbous base 12 cm in diameter. Leaves lanceolate, oblong, slightly narrowed at the broad base, 69 cm long, 15 cm wide, glabrous on the upper surface, beneath silky-velvety, the midrib prominent, silky; petiole 2 cm long, but the blade decurrent to the base; ligule 1 cm long, covered with tufts of silky hairs, arranged in transverse lines. Sheath striate, with small, round or linear pustules, each bearing a tuft of silky hairs. Inflorescence clustered, scarlet, on peduncles 1 cm thick, covered with silky hairs. Spike 4 to 5 cm long, ovoid. Bracts ovate, acute, pungent, glabrous, red, longitudinally striate with rather high narrow ridges, with a line of pustules or transverse bars between each rib, the inner bracts lanceolate. Flowers not seen. Fruits glabrous, 2 cm long, flattened, elliptic, beaked, bearing the remains of the calyx, finely ribbed, thin-walled, with numerous oblong to pyriform seeds which are irregular in form, but usually truncate, 2 mm long.

Negros, Cuernos Mountains, near Dumaguete, *Elmer 10365*, in fertile glens at an altitude of about 1200 m.

As a rule it is not advisable to describe a *Hornstedtia* as new, without seeing the flowers, but an exception may be made in the case of this curious species. The peculiar sheath and ligule, as well as the small flattened fruit, is quite unique in the genus. In some of the islands of the Eastern Archipelago, species are found in which the leaf-sheaths are not only ribbed longitudinally, but also

have transverse bars at intervals, giving them a reticulated appearance. In the above species the transverse bars are sometimes reduced to round pustules bearing tufts of silky hairs, so that the sheaths appear spotted with white tufts; these tufts run into transverse lines on the ligule.

Endemic.

9. PHAEOMERIA Lindl.

Tall herbs with lanceolate leaves. Capitula obconic or globose on tall peduncles from the rhizome. Outer bracts large, usually spreading, involucral. Floral bracts linear-oblong, colored. Bracteoles tubular, spathaceous. Calyx bifid. Corolla erect, lobes lorate. Lip narrow, short. Stamen-filament linear. Anther oblong, crestless. Fruits obconic, the top rounded or flat, half-woody. Seeds numerous.

Species about 10, Indo-Malayan.

1. **P. imperialis** Lindl. Introd. Nat. Hist. ed. 2 (1836) 446.
Alpinia magnifica Rosc. Monandr. Pl. (1828) *t. 75.*
Nicolaia imperialis Horan. Monogr. (1862) 32, *t. 1.*
Hornstedtia imperialis Ridl. in Journ. Roy. As. Soc. Str. Branch 32 (1899) 148; Mat. Fl. Malay Penin. 1 (1907) 40.

Rhizome short and stout. Stems 4 m tall, 3 cm thick. Leaves oblong, acute, glabrous, 66 cm long, 18 cm wide; ligule ovate, blunt, nearly 3 cm long. Peduncle 1 m tall. Spikes cone-shaped, 12 cm long. Outer bracts ovate-oblong, spreading, 12 cm long, pink. Floral bracts pink-edged, white, linear-oblong. Calyx 1 cm long, deeply bifid. Corolla-tube 3 cm long, the lobes lorate, thin, obtuse, pink. Lip longer, oblong, obtuse, the sides convolute, pink-edged, white. Filament pubescent. Anther emarginate. Fruits obconic, green, hairy.

MINDANAO, District of Davao, *Williams 2943.*
Malay region; often cultivated and probably only so in the Philippines.

10. PLAGIOSTACHYS Ridl.

Stems tall, with lanceolate leaves. Spike or panicle from the side of the leafy stalk, on a short peduncle with sheathing leaves. Flowers small, very densely crowded, with oblong-ovate, laciniate bracts. Calyx spathaceous, short. Corolla-tube short and thick, the lobes oblong, fleshy. Lip flat, oblong. Staminodes two, short, subulate processes. Stamen short and thick. Anther oblong, emarginate, crestless or crested. Capsule ovoid or oblong, crustaceous, 3-celled. Seeds 3 or 4 in each cell.

Species 5, Malay Peninsula and Archipelago.

1. **P. philippinensis** Ridl. in Elm. Leafl. Philip. Bot. 2 (1909) 572.

Stems 1 to 2 m tall. Leaves lanceolate, acuminate, narrowed at the base, 20 cm long, 8 cm wide, glabrous on the upper surface, more or less pubescent beneath; ligule truncate; sheath hairy; petiole winged in adult leaves. Inflorescence lateral, near the base, simple, or 3-branched, cone-shaped, 6 cm long, the branches 4 to 6 cm long, the peduncle stout, covered with ovate sheaths, the rachis and bracts felted-pubescent. Bracts lanceolate, acuminate, woolly. Flowers pale-red. Calyx tubular, bilobed

at the tip, woolly, 1 cm long. Corolla-tube a little longer, the lobes linear-oblong, hooded, all hairy, white with red streaks. Lip obovate, glabrous, with a narrow, bifid, terminal portion, the central bar elevated, fleshy and warty, ending in two short warty elevated arms at the base of the terminal lobe. Staminodes flat, spathulate, as long as the short filament. Anther thick, the crest rounded, distinct. Ovary silky. Capsule obconic, the tip broad, rounded, 1 cm.

LUZON, Province of Tayabas, Lucban, *Elmer 7915:* Province of Laguna, *For. Bur. 9567 bis Curran.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 855:* Province of Misamis, Mount Malindang, *For. Bur. 4574 Mearns & Hutchinson:* District of Davao, Mount Apo, *Copeland 1202.*

Both Mrs. Clemens and Mr. Elmer state that the species is common. It is rather remarkable for the wooliness of its inflorescence and for the distinct prolongation of the anther-connective which extends beyond the anther-cells, and also for the shape of the lip.

Endemic.

2. **P. elegans** sp. nov.

Stems 40 cm tall, glabrous. Leaves narrowly lanceolate, acuminate, caudate, the base acuminate, epetiolate, glabrous, 23 cm long, 2 cm wide; sheath ribbed, glabrous; ligule short, truncate, bifid. Spike less than half-way, protruding from the stem, 2 cm long and thick, simple, obovoid, dense. Bracts broad, wrapping the base of the flower, oblong-ovate, cuspidate, pubescent. Calyx urceolate, ampliate, 5 mm longer than the corolla-tube, the lobes 3, ovate, rather large, all hairy. Corolla-tube short and thick, the lobes lanceolate, the upper one hooded, with a conic mucro, the others blunt. Lip short, broad, quadrate, oblong, bilobed at the apex, base pubescent. Staminodes subulate. Anther oblong, pubescent along the cells which are divaricate at the apex, the connective truncate, not projecting beyond the cells.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens*, July, 1907.

A very distinct species, the smallest known one in the genus.

3. **P. ? parviflora** comb. nov.

Amomum parviflorum Presl Rel. Haenk. **1** (1827) 112, *t. 19.*

Alpinia parviflora Rolfe; Vidal Phan. Cuming. Philip. (1885) 152, partim; K. Schum. in Engl. Bot. Jahrb. **27** (1899) 299; Pflanzenreich **20** (1904) 368.

A slender herb from a horizontal tuberous rhizome. Stems 50 cm tall. Leaves lanceolate or linear-lanceolate, attenuate-acuminate and cuspidate, narrowed at the base, quite glabrous, 30 cm long, 2 cm wide; petiole distinct, 2 cm long; ligule very short, truncate, glabrous. Spike emerging from a leaf-axil shortly above the rhizome, erect, short-peduncled, dense or very dense, looser below, cylindric, obtuse, 5 cm long, 2.5 cm thick. Bracts ovate, acuminate, membranaceous, densely silky-tomentose, 10 mm long. Bracteoles tubular-campanulate, trilobulate, white, glabrous. Ovary glabrous. Calyx 3-lobed, the lobes 5 mm long, triangular, acute, glabrous. Corolla-tube 1 cm long, glabrous. Upper lobe cucullate, 3 mm long, lateral lobe shorter and wider. Lip

oblong, subpanduriform, above and at the lip warty-crested. Staminodes subglobose. Stamen-filament linear, the connective prolonged, tridentate. Anther 2 mm long.

LUZON, (*Haenke*).

I have seen nothing corresponding to this description, nor have I seen Presl's figure quoted above. Schumann makes it to be an *Alpinia* of the section *Bintalua*, which includes this and the next species and a Bornean plant (from Bintulan, whence the name). It is pretty clear from the description that the two Philippine plants are not Alpinias, but are probably *Plagiostachys*.

4. **P.? Rolfei** comb. nov.

Alpinia parviflora Rolfe in Journ. Linn. Soc. Bot. **21** (1884) 316, partim, nomen nudum.

A. Rolfei K. Schum. in Pflanzenreich **20** (1904) 368.

Stem fairly stout. Leaves linear-lanceolate, acuminate, caudate, narrowed at the base, glabrous on both sides, 45 cm long, 8 cm wide; petiole 4 cm long; ligule short, glabrous. Spike projected from a leaf-sheath above the rhizome, cylindric, very dense, the base laxer, obtuse. Bracts at the apex subcomose, 10 cm long, the peduncle with rather large ovate bracts. Bracts clavate, apiculate, 12 mm long, obliquely truncate, the apex only minutely pilose. Ovary glabrous. Calyx cylindric, 12 mm long, 3-toothed, glabrous. Corolla-tube 10 mm long, the upper lobe cucullate, 6 mm long. Filament linear, 3 mm long, crestless. Lip obovate, bilobed, 5 mm long.

LUZON, (*Cuming 1327*, Albay Province, fide Rolfe; Cagayan Province fide Cuming's own list of localities).

I have seen no specimens answering to this description, which is translated from Schumann. It can not be an *Alpinia*, and I think it is probably a *Plagiostachys*.

11. **ADELMERIA** Ridl. in Elm. Leafl. Philip. Bot. **2** (1909) 603.

(*Elmeria* Ridl. l. c. 569, non *Elmera* Rydb. 1905.)

Herbs with few or solitary stems of moderate height. Leaves lanceolate or elliptic. Inflorescence a terminal capitulum. Bracts large, ovate, persistent. Bracteoles utricular, with three acute lobes, ciliate at the tip, the nerves of the bracts and bracteoles anastomosing. Calyx tubular, trifid. Corolla-tube longer, fleshy, the lobes thin, rounded. Lip fleshy, adnate to the stamen. Anther quite entire or bifid, short. Staminodes none. Stamen-filament broad, linear. Anther-cells linear, pubescent, the crest small or none. Style short, slender, filiform. Capsule subglobose, terminated by the calyx-tube, few-seeded.

Philippines; endemic.

Lip bifid ..... 1. *A. bifida*
Lip entire ..... 2. *A. pinetorum*

1. **A. bifida** Ridl. l. c.

Hornstedtia paradoxa Ridl. in Govt. Lab. Publ. (Philip.) **35** (1905) 85.

Elmeria bifida Ridl. in Elmer's Leafl. Philip. Bot. **2** (1909) 568.

Stems solitary, erect or drooping, 1 to 3 m tall, slender. Leaves lanceolate, acuminate, caudate, glabrous, 30 to 45 cm long, 2 to 7 cm

wide, narrowed at the base to a short petiole; ligule oblong, truncate, bilobed, glabrous or nearly so; sheath-margins pubescent. Capitulum ovoid, rounded, nodding, 7 cm long, yellowish-red. Outer bracts ovate, rounded, margins sparingly ciliate, the nerves elevated, anastomosing. Bracteole utricular, inclosing two flowers, tip 3-pointed, ciliate. Calyx tubular, 3-lobed, the lobes acute, ciliate at the tip. Corolla fleshy, tube moderately long, the lobes oblong, the upper one oblong-ovate. Lip adnate at the base to the corolla-tube and stamen, thick, fleshy, deeply bilobed into two linear excurved lobes, convolute when dry. Stamen-filament broad. Anther cells linear, pubescent, appendage small, ovate. Capsule glabrous, subglobose, with few seeds.

LUZON, Mount Banajao, Province of Tayabas, *Elmer 7396;* Lucban, *Elmer 7706:* Province of Benguet, Mount Santo Tomas, *Elmer 6629;* Pauai to Baguio, *Merrill 4786.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1210.*

Endemic, in dense woods at 1,000 to 2,100 m altitude. Margins of the sheaths purplish-red. Cone dark-red. Bracts reddish, with green margins. Flowers yellowish. Complete specimens show that this plant is no *Hornstedtia* or rather *Nicolaia,* but a distinct genus.

2. **A. pinetorum** comb. nov.

Elmeria pinetorum Ridl. l. c. 569.

Plant 2 m tall, all the stems much reclining or recurved. Leaves elliptic or elliptic-lanceolate, acuminate, glabrous, except on the midrib, beneath pubescent and above shortly hairy, the margins ciliate-hairy, 15 cm long, 4 cm wide, base subcuneate, dark-green; petiole very short; ligule 2 mm long, thickly white-ciliate; sheath 7 cm long, edged with stiff white hairs. Capitulum terminal, nodding, globose, 6 cm long, the outer bracts ovate, rounded at the tip, finely striate, glabrous except the white-ciliate edge, dull-red. Bracteole utricular, with three acute lobes, white-hairy at the tip, inclosing two flowers. Calyx tubular, a little longer, with three acute points with tufts of hair at the tips. Corolla-tube cylindric, glabrous, 2 cm long, dilated above, the lobes short, oblong, yellow. Lip fleshy, entire, base saccate, oblong, limb triangular, acute. Stamen shorter, the anther broad, apex deeply excavate. Style slender, shorter. Stigma small, red.

LUZON, Province of Benguet, Baguio, *Elmer 8548,* in small tufts on limestone formation in the pine region at 5,000 ft. altitude, rare, native (Igorot) name *Barapat.*

12. LEPTOSOLENA Presl.

Tall herbs with linear or lanceolate leaves. Inflorescence terminal, paniculate. Flowers sessile or pedicelled, large. Calyx tubular, 3-lobed, split on one side. Corolla-tube longer, lobes linear or lanceolate. Lip entire, oblong, convolute. Staminodes linear-oblong. Stamen short; anther oblong, crested or not.

Referred by Schumann to *Alpinia,* but certainly quite distinct and perhaps allied to *Hedychium.* Species two, endemic.

Flowers pedicelled, 7 cm long ..... 1. *L. Haenkei*
Flowers sessile, 12 cm long ..... 2. *L. insignis*

1. **L. Haenkei** Presl Rel. Haenk. 1 (1827) 111, *t. 18.*
Alpinia leptosolenia K. Schum. in Pflanzenreich **20** (1904) 312.

Stem fairly tall. Leaves sessile, lanceolate, attenuate-acuminate, caudate, base acute, glabrous, 30 cm long, 2.2 cm wide; ligule 2 mm long, retuse, glabrous. Panicle erect, 7 cm long, ovate, many-flowered, rachis glabrous, with usually four bracts at the base. Flowers pedicelled, the pedicels 2.5 cm long. Ovary glabrous. Calyx tubular, 1.5 cm long, tip shortly 2-lobed. Corolla-tube 7 cm long, narrowly tubular, glabrous, the lobes 1.2 cm long, oblong-lanceolate, obtuse. Lip twice as long, oblong, obtuse, recurved. Stamen-filament very short. Anther 5 mm long, connective not prolonged.

LUZON, (*Haenke*).

2. **L. insignis** Ridl. in Govt. Lab. Publ. (Philip.) **35** (1905) 84.

Stem 1 to 2 m tall. Leaves linear, acuminate, glabrous, narrowed to the base, tip caudate, 25 cm long, 1 cm wide, midrib stout; sheaths 15 cm long, with the ligule as an erect pair of auricles oblong and rounded at the tip. Bracts at the base of the inflorescence 3, papery, lanceolate, caudate, 15 cm long, 2 cm wide. Panicle 7 cm long, with distant, 2 cm long branches, each bearing two or three flowers. Flowers sessile, white. Calyx tubular, 6 cm long, bilobed, the lobes short, ovate, the tube split down one side. Corolla-tube slender, 12 cm long, the lobes linear-oblong, obtuse, 2 cm long. Staminodes linear-oblong, shorter and narrower. Lip fleshy, elongate, 2 cm long, rolled up when withered. Stamen short. Anther oblong, the crest broader, large, rounded, entire. Style longer. Stigma cup-shaped, hairy.

LUZON, Province of Benguet, Twin Peaks, *Elmer 6428*, on gravelly land-slides in the pine region.

13. KOLOWRATIA Presl.

Tall herbs. Leaves lanceolate or oblong-lanceolate, petioled, the ligule entire. Inflorescence terminal, branched, rachis flexuous. Spikes alternate, distant, with linear-oblong bracts, densely arranged. Calyx spathaceous, cleft on one side, apex trifid. Corolla-tube short, the lobes broad, hooded. Staminodes subulate. Lip small, obovate, with trilobed apex. Stamen-filament broad, fleshy, adnate to the corolla-tube. Anther linear, elongate, with a short prolongation of the connective. Capsule woody.

Species two, endemic.

1. **K. elegans** Presl Rel. Haenk. 1 (1827) 113, *t. 20.*
Renealmia gracilis Blanco Fl. Filip. (1837) 1.
Renealmia exaltata Blanco l. c. ed. 2 (1845) 1.
Alpinia gracilis Rolfe in Journ. Linn. Soc. Bot. **21** (1884) 316.
Alpinia gigantea F.-Vill. Nov. App. (1883) 225.
Alpinia elegans K. Schum. in Engl. Bot. Jahrb. **27** (1899) 288; Pflanzenreich **20** (1904) 352.

A tall stout herb 2 to 4 m tall, with a stout rhizome, the bases of the stems swollen. Leaves coriaceous, usually reflexed, glabrous, oblong-lanceolate, the apex acute, cuspidate, base rounded, nearly or quite sessile, 30 cm long, 8 cm wide; ligule rounded, entire, reticulate, hairy, 8 mm long; sheath ribbed, hairy above. Inflorescence terminal, 30 cm long, the base of the peduncle covered with a long, papery, linear-lanceolate bract 15 cm long, the rachis above flexuous. Flower-spikes about 8, distant, alternate, sessile, 5 cm long. Bracts linear-oblong, as long as the spike, 1 cm wide, pubescent, the margins ciliate. Flowers 5 or 6 on stout peduncles. Inner bracts keeled. Calyx spathaceous, stiff, 5 cm long, reddish, split to the base on one side, apex with three short, silky points, pubescent. Corolla creamy, as long as the calyx, the tube cylindric, hairy, dilate at the apex, 3 cm long, the upper lobe hooded, lanceolate, mucronulate, 3 cm long, the lateral ones oblong, obtuse, keeled at the tips, mucronate. Lip shorter, obovate, subtrilobed at the apex, blunt. Stamen nearly as long as the upper sepal. Anther linear, curved, 2 cm long, the connective shortly prolonged above the anther-cells, rounded, entire. Style slender, filiform. Capsule woody, ovoid, dehiscing into three segments, 4 cm long; each segment 2 cm wide, yellow, glabrous.

LUZON, Province of Sorsogon, Sorsogon, (*Haenke*): Province of Bataan, Lamao River, Mount Mariveles, *Whitford 73, Williams 309:* Province of Bulacan, *For. Bur. 7217 Curran:* Province of Rizal, *Bur. Sci. 35 Foxworthy, Merrill 1695:* Province of Nueva Ecija, Carranglang, *Merrill 239:* Province of Pampanga, Mount Arayat, *Merrill 1413, Bolster 18:* Province of Tayabas, Atimonan, *Gregory 14:* Province of Benguet, Baguio, *Elmer 8610.* MINDORO, Baco, *Merrill 1271.* LEYTE, Palo, *Elmer 7258, 7287.*

Endemic; very common in thickets along streams in ravines etc.

In some specimens the leaves are very much larger, oblong, and distinctly petioled, 60 cm long, 15 cm wide, with a terminal filiform point 10 cm long, and a petiole nearly 2 cm long, probably the lower or middle leaves on the stem, or perhaps a large form. The leaves on the growing plant are reflexed.

Schumann puts this striking plant under the genus *Alpinia,* which I can not indorse. The genus, however, as he limits it is so wide that it contains many other plants at least as distinct as are most of the genera of *Scitamineae.*

2. **K. erucaeformis** sp. nov.

Stem 3 m tall, reed-like, with distichous, rather coriaceous leaves, which are linear, acuminate, glabrous, 34 cm long, 4 cm wide, the base broad; petiole none; ligule very short, rounded, glabrous. Panicle terminal, 10 cm long, with 6 branches. Branches cylindric, over 5 mm thick, covered with ovate, acute, keeled, ribbed, gray sheaths, pubescent when young. Pedicels short. Calyx spathaceous, with three small points, glabrous, 2 cm long. Corolla-tube shorter, the upper lobe ovate, 2 cm long, the lower ones connate, oblong, ovate, rounded, thinner. Lip shorter, obovate, trilobed, lobes rounded, terminal one entire, thin-tex-

tured, the central bar thickened. Staminodes connate, forming an excavate, rather fleshy, pubescent organ with two thick subulate points at the tip, and one on each side below. Stamen-filament extremely short. Anther long, oblong, pubescent, the crest oblong, truncate, obscurely 3-lobed, with four nerves. Stigma very large, triangular, excavate in front, hairy. Fruit subglobose, glabrous.

BUCAS ISLAND, (northeast coast of Mindanao), *Merrill 5258*, dry slopes at 15 m altitude along the borders of forests. Calyx red, corolla white, fruit reddish-yellow.

A very curious plant, remarkable for the completely connate lower petals, and connate staminodes.

14. ALPINIA Linn.

Rhizome short or fairly long, aromatic. Stems tall, leafy. Leaves lanceolate, shortly petiolate; ligule short. Panicles terminal, the flowers numerous, often showy. Bracts caducous, often petaloid. Calyx-tube short, tubular. Corolla-tube thick, little longer, the lobes linear or oblong. Lip large, convolute, or small, narrow, lobed or entire. Staminodes broad and spathulate or reduced to narrow subulate processes or absent. Stamen-filament thick. Anther broad, the crest usually absent. Fruit globose or cylindric, yellow to black. Seeds numerous, angled, black, inclosed in a sweet aril.

Species about 60, Indo-Malayan, Siamese, Chinese and Australian.

§ CATIMBIUM. Flowers large, the lip entire or subentire, convolute.
- Leaves slightly pubescent; staminodes short, oblong ..... 1. *A. Haenkei*
- Leaves densely velvety beneath; staminodes linear, glabrous .... 2. *A. Copelandii*
- Leaves tomentose on both sides; staminodes hairy ..... 3. *A. trachyascus*
- Leaves thickly pubescent beneath; staminodes ovate, hairy ..... 4. *A. illustris*
- Leaves glabrous.
  - Plant 1 to 2 m tall; staminodes two low crests, silky-hairy at the base. 5. *A. glabrescens*
  - Plant 6 m tall; staminodes linear-oblong, glabrous ..... 6. *A. musaefolia*

§ HELLENIA. Flowers small, lip clawed, usually bifid, often 4-fid, not convolute; panicle lax.
- Panicle large, spreading.
  - Corolla pubescent ..... 7. *A. pyramidata*
  - Corolla glabrous ..... 8. *A. Cumingii*
- Panicle long, dense, pendulous ..... 9. *A. penduliflora*
- Panicle slender, branches 2 or 3, or short.
  - Inflorescence pubescent ..... 10. *A. pubiflora*
  - Inflorescence glabrous.
    - Lip fan-shaped, not lobed ..... 11. *A. flabellata*
    - Lip doubly bifid.
      - Staminodes bifid ..... 12. *A. pulchella*
      - Staminodes entire.
        - Leaves very narrow ..... 13. *A. graminea*
        - Leaves lanceolate.
          - Stamen crested ..... 14. *A. Foxworthyi*
          - Stamen not crested ..... 15. *A. brevilabris*

§ OLIGOCINCINNUS. Panicle-branches spiciform ..... 15. *A. rufa*

§ Catimbium.

1. **A. Haenkei** Presl Symb. Bot. (1832) 66, *t. 43;* K. Schum. in Pflanzenreich **20** (1904) 341.

A. malaccensis Presl Rel. Haenk. **1** (1827) 110, non Roscoe.

A. philippinensis Ridl. in Govt. Lab. Publ. (Philip.) **35** (1905) 86.

Stem 1 to 2 m tall. Leaves oblong-lanceolate or lanceolate, acuminate, base rounded or acuminate, 33 to 55 cm long, 5 to 9 cm wide, hairy on both surfaces or glabrescent above, the edges thickly ciliate-hairy; petiole 3 cm long; ligule bifid, the lobes rounded at the tip, hairy, especially at the tip; sheath hairy. Inflorescence simple or shortly paniculate, 15 to 30 cm long, rachis, branches and pedicels closely silky-hairy. Bracts ovate-oblong or elliptic, 1.5 to 2 cm long, usually hairy, especially at the tip. Calyx short, broadly campanulate, 3-lobed, lobes ovate, acute, hairy, 1 cm long. Corolla-tube shorter, hairy, the lobes white or pink, oblong, obtuse, hairy, 2 cm long, the upper one hooded. Lip broadly ovate, the lateral lobes hardly distinct, 1 cm. long, apex oblong, truncate, narrower, crisped and more or less bifid, all glabrous, orange-yellow with red spots and streaks, except in the mouth of the tube, where there is on either side a line of silky hairs leading from the curved, short, oblong staminodes. Filament linear, hairy. Anther rather short, broad, glabrous. Ovary silky. Capsule globose, 2 cm long, sprinkled with hairs or more hairy when young, red.

Luzon, Province of Bataan, *For. Bur. 1203, 1777, 2477, 2729 Borden, For. Bur. 144 Barnes, For. Bur. 2496 Meyer, Whitford 1058:* Province of Pampanga, Mount Abu, *Bur. Sci. 1942 Foxworthy:* Province of Benguet, Sablan, *Elmer 6089:* Province of Zambales, *For. Bur. 6008 Curran:* Province of Laguna, *For. Bur. 8904 Curran.* Mindoro, Baco River, *Merrill 4047, McGregor 158.* Negros, Canlaon Volcano, *Bur. Sci. 1143 Banks;* Gimagaan River, *Whitford 1570.* Leyte, Palo, *Elmer 7290.* Negros, *Elmer 10244.* Palawan, San Antonio Bay, *Merrill 858.* Balabac, *Bur. Sci. 408 Mangubat.* In shady damp forests near watercourses, endemic.

Alpinia Haenkei is certainly closely allied to *A. malaccensis* Roxb. chiefly differing in its smaller size in all parts. *A. malaccensis* Roxb. is a native of Chittagong, and does not occur, except as a garden plant, in the Malay region. *A. malaccensis* Roscoe, the original species of that name, is based on a figure and description of Rumphius in Herbarium Amboinense, and is indeterminable. The fine series of specimens cited above, leaves me with very little doubt that my *A. philippinensis* is only a form of *A. Haenkei,* which is widely distributed in the Philippines.

2. **A. Copelandii** sp. nov.

Stem 2 m tall. Leaves oblong-lanceolate, long-cuspidate, the base unequal, cuneate, the upper surface glabrous, except the hairy channeled midrib and edge, the lower surface velvety silky-pubescent, 56 cm long, 10 cm wide; petiole stout, 7 mm long, hairy; ligule 1 cm, bilobed, the lobes subacute, velvety; sheaths pubescent. Raceme stout, peduncle stout, 10 cm long, densely yellow-hairy, the inflorescence 15 cm long, crowded, the pedicels short, yellow-hairy. Bracts oblong, 2 cm long, sparsely pubescent. Calyx broad, 1 cm longer than the corolla-tube,

bilobed. Corolla-tube short, the lobes oblong, truncate, 2 cm long, silky-hairy. Lip broadly rhomboidal, 4 cm wide, 3.5 cm long, lateral lobes very large, the apex (terminal lobe) quadrate, shortly bilobed, the disk at the base of the middle lobe regularly pustular. Staminodes linear, 1-veined, glabrous. Stamen-filament glabrous. Anther short.

MINDANAO, District of Zamboanga, *Copeland,* February, 1905.

3. **A. trachyascus** K. Schum. in Pflanzenreich **20** (1904) 336.

Moderately tall. Leaves lanceolate, attenuate-acuminate and caudate, the base acute, both surfaces subtomentose, especially the lower one, the edges shortly and densely subgolden-ciliolate, 60 to 65 cm long, 6 to 7 cm wide; sheaths striate, tip and upper edge golden-tomentose; petiole 8 cm long; ligule acute, nearly 1 cm long, coriaceous, subtomentose. Raceme-rachis glabrous. Pedicels 6 to 7 cm long, golden-tomentose. Bracts fusiform before opening, 3 to 3.2 cm long, scabrid with dense, rigid, very short hairs. Ovary silky. Calyx before flowering 2.2 cm long, tridentate, the two posterior teeth longer. Corolla silky outside. Staminodes golden-hairy.

MINDANAO, District of Davao, Sibulan, in forests, (*Warburg 14584*), in Herb. Berol.

Endemic.

The lip is not described, but the distinctive characters of the plant are given as the rough bracts and the rather lax raceme which is also said to be glabrous.

4. **A. illustris** sp. nov.

Stem 3 m tall. Leaves large, 65 cm long or more, 6 to 9 cm wide, oblong, petioled, cuspidate, the lamina sparingly pubescent on the upper surface, thickly pubescent beneath; petiole 4 cm long, densely pubescent; ligule short, densely hairy; sheath very sparsely pubescent. Panicle dense and large, over 30 cm long, the rachis thick hairy. Branches short, 2- or 1-flowered, densely hairy. Bract large, oblong, hairy, 3 cm long. Corolla-tube short. Petals oblong, obtuse, the upper one hooded, 2 cm long, 5 mm wide, hairy. Lip 4 cm long, 2.5 cm wide, rhomboid when spread out, the lateral lobes subacute and narrow, apex crisped, denticulate. Staminodes a pair of ovate, rounded lobes, densely hairy at the base, rather large, attached to the lip. The lip has a central channel with two side ribs and is bullate along the outside of the ribs. Stamen-filament densely hairy, 1.5 cm long, the anther nearly as long.

PALAWAN, *Bur. Sci. 514 Foxworthy.*

Allied to *A. nobilis* Ridl. but the flowers are smaller and the lip narrower and more distinctly lobed.

5. **A. glabrescens** sp. nov.

Stems 1 to 2 m tall. Leaves almost completely glabrous, subcoriaceous, oblong, acuminate with a long cusp, 30 cm long, 10 cm wide, the cusp 4 cm long, the base narrowed to a short, 1 cm long, stout, glabrous petiole; ligule longer, entire, hairy on the back; sheath strongly ribbed, glabrous. Panicle over 15 cm long, on a peduncle equally long covered with close,

stiff, short, rusty hairs. Branches of the inflorescence usually 2-flowered. Bracts oblong, cuspidate, 2 cm long, glabrous except the pubescent tip and cusp. Ovary globose, scabrid. Calyx campanulate, 1.5 cm long, 3-lobed, the lobes acute, deeply split on one side, scabrid-pubescent. Corolla-tube shorter, glabrous, the lobes broadly oblong, truncate, the upper one 2 cm long, 1 cm wide. Lip 3 cm long, ovate, acuminate, the apex rounded, crisped, retuse, a central keel near the base, apparently yellow, blotched with red. Staminodes two low rounded crests covered at the base with silky hairs, the mouth of the corolla-tube also silky-hairy. Filament long, glabrous. Anther short. Capsule 2 cm long, nearly glabrous, a few hairs at the base, strongly ribbed.

BATANES ISLANDS, Santo Domingo de Basco, *Bur. Sci. 3679 Fénix, Bur. Sci. 3141 Mearns.* Hillsides; flowers yellow.

6. **A. musaefolia** Ridl. in Elm. Leafl. Philip. Bot. 2 (1909) 604.

Stems two or three together, about 6 m tall, 14 cm in diameter at the base. Leaves three to five on a stem, 14 to 20 cm apart, oblong, glabrous, subherbaceous, 1.2 to 2.1 m long, 24 cm wide, midrib stout, dark green above, paler beneath; petiole 10 cm long. Inflorescence terminal, glabrous, spicate, the peduncle 30 cm long, 2 cm thick, the rachis about 60 cm long. Flowers subsessile, pedicels thick, 3 mm long. Calyx campanulate, broad, 1 cm long, the lobes short, rounded, glabrous, green. Corolla-tube as long as the calyx, thick, the lobes broad, oblong, thick-textured, succulent, the upper one hooded, 1 cm long, white, the lip a little longer and with thinner edges, lanceolate, boat-shaped, entire, the apex blunt, entire. Staminodes rather large, linear-oblong, fleshy, glabrous, obtuse. Anther linear-oblong, the connective slightly prolonged and emarginate. Fruit obovoid, glabrous, smooth.

NEGROS, Cuernos Mountains, near Dumaguete, *Elmer 9539*, at an altitude of about 1200 m. A remarkable plant on account of its banana-like size and habit, and absolutely glabrous in all parts. Its nearest affinity is with *A. glabrescens* Ridl.

Endemic.

§ HELLENIA.

7. **A. pyramidata** Blume Enum. Pl. Jav. 1 (1827) 58.

A. galanga Sw. var. *pyramidata* (Blume) K. Schum.; Pflanzenreich 20 (1904) 316.

Stem tall and stout. Leaves lanceolate, acute, the base acuminate, 45 cm long, 8 cm wide, the upper surface glabrous, beneath hairy; petiole hardly distinct, 1 cm long; ligule nearly as long. Panicle dense, many-flowered, 35 cm long, the rachis below very stout, densely pubescent, branches 2 cm long. Bracts lanceolate, deflexed, 5 mm long. Flowers 3 cm long, the pedicel 8 mm. Calyx short, tubular, equally 3-lobed, the lobes triangular, acute, pubescent, 1 cm long. Corolla-tube a little longer, thick, the lobes linear-oblong, the upper one hooded, all pubescent. Lip spathulate, the claw straight, the limb triangular, base cuneate, apex

deeply bifid, the lobes again retuse, almost bilobed, margins toothed. Staminodes rather large, fleshy, subulate. Stamen-filament linear, channeled. Anther linear-oblong, the connective much broader than the narrow cells.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 612*. NEGROS, *Elmer 10314*.

Java and Borneo.

Schumann makes this only a variety of the commonly cultivated *A. galanga* Sw. but apart from its hairiness the lip and staminodes are very different.

8. **A. cumingii** K. Schum. in Pflanzenreich **20** (1904) 315.

Not a stout plant in proportion to its inflorescence. Leaves subsessile, linear-lanceolate, acuminate, attenuate, subfiliform-caudate, glabrous except for the puberulous edge and tip, 45 cm long, 5.5 cm wide; petiole 5 mm long; ligule coriaceous, 5 mm long, the edge ciliate. Panicle long, narrowly cylindric, 40 cm long; branches 6-flowered, crowded, the rachis pilose. Bracts small, oblong, 2 mm long, caducous. Pedicels 2 cm long. Ovary glabrous, 2.5 mm long, elliptic. Calyx tubular, 1 cm long, puberulous, shortly 3-lobed, the lobes ovate, hairy on the edges. Corolla-tube distinctly longer, glabrous, the lobes linear-oblong, hooded. Lip shorter, deeply bifid, the lobes again shortly divided, the outer lobule ovate, the inner linear, cylindric, blunt. Staminodes linear-subulate, shorter than the claw of the limb. Stamen-filament a little longer than the lip; anther nearly as long, glabrous, crestless.

LUZON, Province of Albay, (*Cuming 859*).

Endemic.

9. **A. penduliflora** Ridl. in Elm. Leafl. Philip. Bot. **2** (1909) 571.

A tufted plant 3 to 4 m tall. Leaves elliptic-lanceolate, acute, acuminate, base rounded, glabrous, 35 cm long, 16 cm wide, the midrib stout, the petiole very short; ligule as long as the petiole, truncate, entire; sheath broad, glabrous. Inflorescence 45 cm to 1 m long, terminal, pendulous; peduncle short, the rachis stout; branches very numerous, puberulous, 2 cm long, clustered, with short, lateral, erect branchlets. Bracts small, ovate, puberulous. Calyx tubular, about 1 cm long, trifid, with three pubescent, subacute, lanceolate lobes. Corolla-tube barely as long, the lobes white, the upper one linear-oblong, obtuse, the lateral ones broader, oblong, rounded. Lip broadly obcuneate, bilobed, lobes crisped and rounded. Stamen-filament rather short and thick; anther-cells large, the crest ovate, rounded. Capsule globose, about 1 cm long, glabrous, ribbed, many-seeded.

LEYTE, Palo, *Elmer 7288*.

Perhaps most closely allied to *A. galanga* Sw.

An allied plant with similar foliage and fruit, but with a very dense raceme, with shorter, very crowded, silky branches, is represented by *For. Bur. 947 Barnes*, from Mount Santo Tomas, Province of Benguet, Luzon, but there are no flowers on the specimen.

Endemic.

10. **A. pubiflora** K. Schum. in Pflanzenreich **20** (1904) 313.
Hellenia pubiflora Benth. in Hook. Lond. Journ. Bot. **2** (1843) 235.

Stem 1 to 2 m tall, slender. Leaves narrow, linear-lanceolate, attenuate, very acuminate, glabrous, 30 cm long, 3 cm wide, narrowed to the base, hardly petioled; ligule 5 mm long, ovate, edge white-ciliate. Panicle 20 cm long, the peduncle about 10 cm long, inclosed in the upper leaf-sheaths, the two lower branches distant, 5 to 10 cm long, the upper part fairly dense, with short branchlets each carrying 3 or 4 flowers, the rachis and branches pubescent. Bracts caducous. Flowers white, nearly 2 cm long. Calyx tubular, gradually dilated upward, 3-lobed, the lobes obtuse, ovate, all pubescent. Corolla-tube hardly longer, the lobes oblong, rounded at the tip, glabrous. Lip fleshy, base narrowed, channeled, limb bifid into two unequal, linear-oblong lobes much shorter then the petals. Stamen glabrous; filament nearly twice as long as the lobes; anther half as long as the filament, crestless. Staminodes short, tooth-like, from the tube of the lip. Fruit globose, glabrous, 1 cm long, 4-seeded.

Luzon, Province of Benguet, *Elmer 6268*. Guimaras, *Ritchie 34*. Mindanao, Taumo, (*Warburg 14586*): District of Davao, *Copeland 319:* District of Zamboanga, *For. Bur. 9100 Whitford & Hutchinson:* Province of Surigao, *Bolster 213*.
Endemic.

11. **A. flabellata** sp. nov.

Stem slender, about 1 m tall. Leaves narrow, lanceolate, acuminate, with a long point, glabrous, margins denticulate at the tip, 30 cm long, 2 cm wide; petiole short, or sometimes 1 cm long; ligule ovate, entire, the margins minutely white-pubescent. Panicle rather strict, with two or three densely flowered ascending branches, glabrous, the peduncle 15 cm long, the panicle as long. Bracts minute. Calyx cylindric, tubular, the lobes 3, short, ovate, obtuse, ribbed, all glabrous, 8 mm long. Corolla-tube a little longer, the upper lobe oblong, hooded, mucronulate, the lower lobes obovate-oblong, rounded. Lip nearly as long, fan-shaped, not bifid, with a short claw, then expanding abruptly into a subreniform 4-lobed limb, the lobes subequal, the lower ones broadest, all rounded and strongly veined. Staminodes nearly as long as the claw of the lip, linear from a broad base. Stamen-filament short, linear, glabrous. Anther oblong, shorter, crestless.

Luzon, Province of Benguet, *Bur. Sci. 2718, 2871 Mearns:* Province of Rizal, Bosoboso, *Merrill 1878*. Mindoro, Pola, *Merrill 2226*.

Var. **major** var. nov.

A stout plant 6 m tall. Leaves ovate-lanceolate, acuminate, glabrous, 16 to 30 cm long, 5 to 7.5 cm wide, the base broad; petiole short or none;

ligule 1 cm long or less. Panicle 15 to 35 cm long. Corolla-tube hardly longer than the calyx. Flowers yellow, otherwise as in the species.

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4574 Mearns & Hutchinson.* MINDORO, Mount Halcon, *For. Bur. 4458 Merritt.* CAMIGUIN, Babuyanes Islands, *Bur. Sci. 4086 Fénix.*

12. **A. pulchella** K. Schum. in Engl. Bot. Jahrb. **27** (1899) 276, *t. 2, f. E;* Pflanzenreich l. c. 315.

Globba pulchella K. Schum. Fl. Kais.-Wilhelmsl. (1889) 26.

Stem slender, 2 m tall. Leaves lanceolate, attenuate-acuminate at both ends, glabrous, 32 cm long, 6 cm wide; petiole 2.5 cm long; ligule truncate, 1 cm long. Panicle elongate, 25 cm long, with one or rarely two primary branches, glabrous. Flowers pedicelled, the pedicels 2 mm long. Bracts minute. Ovary glabrous. Calyx 5 to 6 mm long, shortly toothed. Corolla red, the tube 7 mm long, the lobes 5 mm long, blunt. Lip bilobed, the lobes bifid, white, rosy-streaked, 5 mm long. Stamen 6 mm long, crestless. Staminodes short, bifid. Capsule red, 1.2 cm in diameter, 2- or 3-seeded, the seeds 7 mm thick.

MINDANAO, near Taumo, (*Warburg*), in Herb. Berol. New Guinea.

This species differs from *Alpinia brevilabris* in its much larger capsule, and in its "staminodia bicruria". I have seen no species of *Alpinia* with lobed staminodes, and I do not understand Schumann's figure in the Pflanzenreich.

13. **A. graminea** sp. nov.

Stem 1.5 m tall, slender. Leaves very long and narrow, linear, acuminate, 30 cm long, 5 to 10 mm wide, glabrous, sessile; ligule lanceolate, adnate to the base of the leaf by its back, margins sparingly ciliate. Inflorescence very slender, 15 cm long. Flowers pink, in pairs or threes on very short, 2 mm long branchlets, glabrous, 2 cm long. Calyx long, tubular, above a little dilated, the lobes broad, ovate, rounded, mucronulate, minutely ciliate, one narrower than the others. Corolla-tube barely longer, lobes thin, oblong, obtuse, hooded. Lip deeply bifid, shorter than the corolla-lobes, fleshy, the lobes bifid, inner lobule linear, truncate, the outer rounded, ovate-oblong. Staminodes as long as the claw of the lip, fleshy, terete, subulate. Stamen-filament as long as the lip. Anther nearly as long, crestless.

NEGROS, Mount Silay, at 600 m altitude, *For. Bur. 7267 Everett.*

The flowers resemble those of *Alpinia alba* Teysm. and still more those of *A. Cumingii*, from which this differs in its narrow leaves and glabrous calyx.

14. **A. Foxworthyi** sp. nov.

Stem 1 m tall, slender. Leaves narrowly linear-lanceolate, acuminate, narrowed at the base to a very short petiole, 13 cm long, 1 cm wide, glabrous, margins at the apex armed with small brown thorns, the petiole 5 mm long; ligule small, entire, ovate, glabrous. Peduncle slender, 15

cm long or more. Panicle dense, 7 to 10 cm long, with short, 2-flowered branches. Bracts very small, caducous. Calyx short, ampliate, urceolar, 5 mm long, glabrous, the lobes very short and broadly ovate. Corolla-tube a little longer, the upper lobe oblong, hooded, the lateral ones oblong, blunt. Lip flabellate, 4-lobed, the claw thick, rather short, the two lateral lobes of the limb broad, rounded, the middle one bifid, the lobules narrow, triangular-lanceolate, limb strongly nerved. Staminodes short, subulate. Anther very short, crested, the crest large, oblong, truncate; filament short.

PALAWAN, near Iwahig, *Bur. Sci. 772 Foxworthy.* Flowers white.
Allied to *A. conchigera* and to *A. rosella* Ridl.

15. **A. brevilabris** Presl Rel. Haenk. 1 (1827) 110, *t. 17;* Schum. in Pflanzenreich l c. 314.

Stem 2 to 3 m tall. Leaves lanceolate, acuminate, 18 to 30 cm long, 3 to 8 cm wide, glabrous, denticulate on the edge near the tip; petiole 5 mm long; ligule ovate, rounded, entire, minutely white-ciliate at the tip; sheath glabrous, striate. Panicle 25 cm long, the peduncle nearly the same length, glabrous, branches two, 8 cm long, the terminal portion with short branchlets, each with 3 or 4 flowers. Bracts caducous. Calyx tubular, 1 cm long, 3-lobed, the lobes ovate, short, glabrous. Corolla-tube one-fourth longer than the calyx, the lobes short, broad, oblong-ovate, blunt, rounded at the tip. Lip short, broadly and shortly bilobed, the lobes bilobed, the lobules oblong, truncate, divaricate. Staminodes simple, linear, fleshy, half as long as the filament, which is hardly longer than the 1 cm long crestless anther. Fruit globose, glabrous, bright-red, 5 mm in diameter.

LUZON, Province of Bataan, *Whitford 58, For. Bur. 6520 Curran, For. Bur. 2203 Meyer, Elmer 6859, 6853, For. Bur. 1202, 2931 Borden, Merrill 5193:* Province of Benguet, *Elmer 6268:* Province of Zambales, *Merrill 2073:* Province of Tayabas, *Whitford 655, Gregory 55.* BATAN, Batanes Islands, Santo Domingo de Basco, *Bur. Sci. 3580 Fénix.* MINDORO, Baco River, *McGregor 162, 184, For. Bur. 5253, 5489 Merritt.* MASBATE, *For. Bur. 1703 Clark.* BASILAN, *For. Bur. 3999 Hutchinson.* NEGROS, *Elmer 9501, 9531.*

Alpinia brevilabris seems to be a rather abundant species, as well as widely distributed in the Philippines. Most of the collectors give the color of the flowers as white with pink veining.

§ OLIGOCINCINNUS.

16. **A. rufa** K. Schum. in Engl. Bot. Jahrb. **27** (1899) 293; Pflanzenreich l. c. 361.

Hellenia rufa Presl Rel. Haenk. 1 (1827) 114, *t. 21.*

Stems 1.5 m tall, rather slender. Leaves elliptic-lanceolate or lanceolate, rather abruptly cuspidate, sessile, 25 to 30 cm long, 4 to 6 cm wide, hairy all over with long appressed hairs; ligule oblong, obtuse, densely

villous-hairy; sheath villous especially on the keel and edges. Panicle 5 to 8 cm long, with a short villous rachis and 5 to 8 branches from 3 to 7 cm long, covered with short, ovate, ribbed, persistent bracts. Basal bracts linear-lanceolate, 1 cm long, villous. Flowers shortly pedicelled, 14 mm long. Calyx cylindric, 3-toothed, villous. Corolla-tube exceeding the calyx, 14 mm long, the lobes linear-oblong, the upper one largest, hooded, the other two with a kind of terminal boss, all hairy, the two lateral ones only near the tip. Lip short, bifid to the mouth of the tube, the lobes linear-oblong, truncate, glabrous, adnate to the linear, acute staminodes which are nearly as long, and to the stamen-filament which is linear, glabrous and rather short. Anther oblong, with a small semi-ovate crest. Capsule globose, 1.2 cm in diameter, red, sprinkled with scattered hairs. Seeds 5 mm long, subtrigonous, smooth.

LUZON, Province of Sorsogon, (*Haenke*): Province of Tayabas, (*Warburg*), *Elmer 9078*. NEGROS, Gimagaan River, *Copeland, Whitford 1649;* Talaban River, *For. Bur. 5590 Everett;* Cuernos Mountains, *Elmer 9578*. MINDANAO, Dagatpan, (*Warburg*). BUCAS, *Merrill 5273*.

DOUBTFUL SPECIES.

A. mollis Presl Rel. Haenk 1 (1827) 110; K. Schum. l. c. 369.

A slender herb, the stems 30 cm long. Sheaths glabrous, striate. Leaves shortly petiolate, oblong-lanceolate, acuminate, narrowed into a petiole, the uper surface glabrous, beneath silky-tomentose, soft, 13 to 16 cm long, 2.3 cm wide; ligule 4 mm long, obtuse, villous. Panicle erect, terminal, with sometimes a longer branch at the base. Rachis velvety. Flowers very shortly pedicelled, unknown. Capsule globose, 6 to 10 mm in diameter, yellowish, subtomentose, few-seeded.

LUZON, (*Haenke*).

Schumann was unable to find the type of this species, and the description is too imperfect to identify it.

15. COSTUS Linn.

Tall herbs, the stems often spiral, sometimes branched. Leaves lanceolate, shortly petioled, the ligule forming a complete ring. Flower-spike terminal or basal. Bracts stiff, often spiny. Calyx tubular, 3-lobed. Corolla-tube broad-funnel-shaped, as long as the calyx-tube, the lobes large, lanceolate or oblong. Lip large, obovate, usually entire, broadly trumpet-shaped. Staminodes absent. Stamen very broad and thin, the connective large, acute or curved upward. Anther-cells linear. Fruit a woody capsule splitting on one side. Seeds numerous, angled.

Species about 40, chiefly South American and African; a few Indo-Malayan.

Spike terminal on the leafy stem ..... 1. *C. speciosus*
Spike radical ..... 2. *C. clemensae*

1. **C. speciosus** Sm. in Trans. Linn. Soc. 1 (1800) 249; Roxb. Fl. Ind. 1 (1820) 58; Blume Enum. Pl. Jav. 1 (1827) 61; Wight Icon. *t. 2014;* Horan. Monogr. (1862) 37; Baker in Hook. f. Fl. Brit. Ind. 6 (1892) 249; K. Schum. in Pflanzenreich 20 (1904) 398; Ridl. Mater. Fl. Malay Penin. 2 (1907) 24.

C. arabicus Linn. Sp. Pl. (1753) 2, in part.

C. crispiflorus Stokes Mat. Med. 1 (1812) 75.

C. glabratus Reichb. f. in Moessl. Handb. ed. 2, 1: 8, non Sw.

C. vaginalis Salisb. in Trans. Hort. Soc. 1 (1812) 277.

C. Loureiri Horan. Monog. (1862) 39.

C. foeniculaceus Noronha in Verh. Bataav. Genootsch. 5 (1795) 12.

C. nipalensis Rosc. Monandr. Pl. (1828) *t. 80;* Horan. Monog. (1862) 37; Regel Gartenfl. 4 (1855) 341, *t. 139.*

Banksia speciosa Koen. in Retz. Obs. 3 (1783) 75.

Amomum hirsutum Lam. Ill. Gen. 1 (1791) *t. 3.*

A. arboreum Lour. Fl. Cochinch. 1 (1790) 9.

Hellenia grandiflora Retz. Obs. 5 (1786) 18.

Stems 2 to 3 m tall, 1 to 2.5 cm thick, covered with dull-brown sheaths, often branched above and spiral. Leaves oblong or lanceolate, acuminate, 15 to 20 cm long, 6 to 7 cm wide, the upper surface glabrous, dark-green, beneath more or less pubescent; petiole 3 to 6 mm long; ligule short, annular, reddish. Spike terminal, ovate or oblong, 7 to 13 cm long. Bracts ovate, mucronate, not pungent, red, 2 cm long, glabrous or pubescent. Bracteole shorter, lanceolate, acute. Calyx short, cartilaginous, red, the lobes very short. Corolla-tube short, the lobes equal, mucronate, white, often rose-tinted. Lip very large, obovate, convolute, 9 cm long and wide, white with usually a longitudinal central yellow bar. Stamen 4.5 cm long, the filament broad, hairy on the back, the crest oblong, acuminate, orange beneath. Capsule 1.3 cm long, woody, red. Seeds small, black, with a white aril, 4 or 5 in each cell.

LUZON, Province of Cavite-Batangas, *For. Bur. 7646 Merritt;* Province of Bataan, *For. Bur. 196 Barnes, Elmer 6707, For. Bur. 2771 Meyer, Williams 312, For. Bur. 2460 Borden:* Province of Rizal, *For. Bur. 3426 Ahern's collector:* Province of Tayabas, *Gregory 80, Whitford 830:* Province of Batangas, *Cuzner 21.* LEYTE, *Elmer 7363.* MASBATE, *Merrill 3393, For. Bur. 1696 Clark.* CEBU, *Bur. Sci. 1727 McGregor.* MINDANAO, Lake Lanao, *Mrs. Clemens.* BASILAN, *Hallier s. n.*

Var. **argyrophyllus** Wall. Cat. 6555; Baker in Hook. f. Fl. Brit. Ind. 6 (1890) 250; Ridley Mater. Fl. Malay Penin. 2 (1907) 24.

Costus sericeus Blume Enum. Pl. Jav. 1 (1827) 62.

A more slender woodland form, with more branched stems, the leaves more pubescent, often silky on the back. Bracts and calyx less brightly colored. Flower-spikes and flowers smaller. Lip without the yellow central bar. Whole flower usually more distinctly pink-tinted.

MINDANAO, District of Davao, *Copeland 448.* Basilan, *DeVore & Hoover 27.* LUZON, Province of Bataan, *Bur. Sci. 1588 Foxworthy.* NEGROS, *For. Bur. 5592 Everett.*

India to Ceylon, Pegu, Tonkin, Formosa, the Malay Peninsula and Archipelago to New Guinea.

Considering the wide distribution of this conspicuous plant, it seems to vary but little, though Schumann describes six varieties, of which the woodland form of

the plant, var. *argyrophyllus*, is the only at all distinct one, and there are intermediate forms between the large typical form and that. The chief variations in the plant lie in the amount of pubescence, the size of the flowers and of the spike, the amount of rose-tinting of the corolla, and the amount of yellow in the lip.

2. **C. Clemensae** sp. nov.

Rhizome woody. Stem 1 m or more tall, thick. Leaves oblanceolate, acuminate, narrowed at the base, 12 cm long, 4 cm wide, the upper surface glabrous except the midrib, the lower surface covered with appressed, silky hairs; sheath 2 to 4 cm long, ribbed, thickly hairy; ligule ciliate; petiole densely hairy. Inflorescence from the rhizome, the peduncle thick, about 3 cm long, covered with sheathing bracts, hairy. Spike 8 to 10 cm long, 7 cm thick, red. Bracts lanceolate, closely ribbed, silky-hairy, 3 cm long, 1 cm wide, with a stout thorn-like mucro 5 mm long. Inner bract similar but narrower, 2.5 cm long, 4 mm wide. Calyx tubular, with three short, ovate, mucronate, pungent lobes, densely hairy, 3 cm long, 1 cm thick. Corolla white, the tube shorter than the calyx, hairy, the lobes linear-oblong, acuminate, acute, densely hairy outside, glabrous within, 2 cm long, nearly 1 cm wide. Lip 3 cm long, the center fleshy-papillose, the margin undulate, crisped, glabrous. Stamen shorter, the anther linear-oblong, the connective linear-oblong, the apex subacute, 1 cm long. Stigma very large, flabellate, reniform, the margins ciliate.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1173*.

A very striking plant with the habit of *Costus globosus* Blume, but distinct in its pubescent white corolla, very long connective-crest, and large reniform stigma.

MARANTACEÆ.

16. DONAX Lour.

Stems tall, shrubby, much branched. Leaves ovate or oblong, the petiole short; ligule none; sheaths long. Panicles erect or pendulous, lax. Bracts narrow-lanceolate. Flowers small, white. Corolla-tube usually long. Staminodes obovate, unequal. Ovary 3-celled, the cells 1-ovuled. Style stout, incurved. Fruit usually indehiscent, 1- to 3-seeded, globose or trigonous. Seeds globose or hemispheric.

Species 5, Indo-Malayan.

1. **Donax cannaeformis** Rolfe in Journ. Bot. **45** (1907) 243.
Thalia cannaeformis Forst. f. Fl. Ins. Austr. Prodr. (1790) 1.
Ilythuria cannaeformis Raf. Fl. Tellur. **4** (1836) 51.
Actoplanes cannaeformis K. Schum. in Pflanzenreich **11** (1902) 34.
Donax arundastrum K. Schum. in Pflanzenreich **11** (1902) 33, *quoad philippinense*, non Lour.

Stems 2 to 3 m tall. Leaves ovate, thin, glabrous, 15 to 18 cm long, 9 cm wide; petiole 1 cm long. Panicles 15 cm long or less, few-branched, the nodes hairy. Bracts papery, lanceolate, acute, 3 cm long. Flowers white, 3 cm long. Calyx-tube 1 cm long, the lobes lanceolate, acute, ribbed. Corolla-lobes linear-oblong, longer than the tube. Staminodes

obovate, large. Lip smaller, entire, obovate, clawed. Anther linear, the filament and lobe linear, the lobe long, linear, obtuse. Ovary silky. Fruit sparingly hairy, globose, 1 cm thick, 1-seeded. Seed oblong, rather strongly wrinkled.

LUZON, Province of Laguna, *Cuming 465:* Province of Isabela, Casiguran, *Bur. Sci. 2988 Mearns:* Province of Cavite, *For. Bur. 7619 Rosenbluth:* Province of Laguna, *Bur. Sci. 6022 Robinson:* Province of Benguet, Sablan, *Elmer 6104:* Province of Pampanga, Arayat, *Merrill 1412:* Province of Bataan, *Merrill 1546, Whitford 59, Williams 4:* Province of Nueva Viscaya, *Merrill 230:* Province of Tayabas, *Gregory 100.* MINDORO, *For. Bur. 3690* Merritt; Paluan, *Merrill 945;* Pola, *Merrill 2453.* CULION, *Merrill 660.* PALAWAN, *Bur. Sci. 763 Foxworthy, Bur. Sci. 303 Bermejos.* BALABAC, *Bur. Sci. 454 Mangubat.* CAMIGUIN, Babuyanes Islands, *Bur. Sci. 3933 Fénix.* MINDANAO, Davao, *Copeland 445, De Vore & Hoover 198, 240:* District of Zamboanga, *Copeland s. n.:* Province of Misamis, *For. Bur. 4744 Mearns & Hutchinson:* Lake Lanao, *Mrs. Clemens 90.*

Java and Celebes to New Guinea.

D. cannaeformis Rolfe most closely resembles *D. grandis* Ridl. in its size and fruit, but is easily distinguished by its larger flowers, its stamen with a long-linear lateral lobe, its silky-pubescent ovary, and its fruit covered thinly with hairs. The seed is more oblong and wrinkled.

K. Schumann in Pflanzenreich 11 has made a sad mixup in this simple genus. At present only four species are known, as follows:

D. arundastrum Lour., a dwarf plant with larger flowers than the others, and a turbinate 3-seeded fruit. It is abundant on river banks from Siam, Cochinchina and India to the Malay Peninsula.

D. parviflora Ridl., a native of the Malay Peninsula.

D. grandis Ridl., a very large plant, with globose, glabrous, 1-seeded fruits and smaller flowers, ranging from Siam to Singapore.

D. cannaeformis Rolfe, ranging from Java to New Guinea and the Eastern Archipelago, an often tall plant with larger flowers than *D. grandis*, and 1-seeded hairy fruit.

17. **PHACELOPHRYNIUM** K. Schumann.

Tufted herbs with long-petioled leaves. Inflorescence a dense or interrupted panicle of spikes, with distichous bracts, from a leaf-petiole. Flowers in pairs or threes, pedicellate. Bracteoles two to each flower. Sepals linear or subovate. Corolla-tube short or very short, the lobes oblong. Lip with an oblique villous ridge. Petaloid stamen spathulate or ovate, cucullate, short. Ovary 3-celled. Capsule 3-angled, 3-, rarely 2-seeded. Seed 3-angled.

Species 7, Nicobar Islands, the Malay Peninsula and Archipelago.

1. **P. interruptum** K. Schum. in Pflanzenreich 11 (1902) 121.

Stems 2 to 3 m tall. Leaves lanceolate or elliptic-lanceolate, 30 cm long, 9 to 11 cm wide, glabrous; petiole 3 to 5 cm long; sheath glabrous. Inflorescences usually three, interruptedly panicled, 12 to 20 cm long, the internodes about 8 cm long, the racemes fascicled, fairly dense, four together, 5 cm long. Primary bracts oblong-lanceolate or ovate, 4 cm long or less. Floral bracts about 8, oblong, obtuse, fleshy, 1 cm long. Flowers yellow, in pairs on pedicels 5 mm long. Ovary triquet-

rous, pear-shaped, glabrous, trilocular. Sepals ovate-oblong, acuminate, 4 mm long. Corolla-tube hardly 2 mm long, the lobes oblong. Outer staminode 3 mm long. Lip with a villous callus. Capsule trigonous, faintly wrinkled, 3-seeded, apex depressed. Seeds chestnut, transversely furrowed, with a short bilobed aril.

LUZON, Province of Cagayan, Enrile, (*Warburg 12160*): Province of Laguna. *Hallier:* Province of Rizal, Santander, *Bur. Sci. 3282 Ramos;* Montalban, *Merrill 5058;* (*Warburg 12495*); Bosoboso, *Bur. Sci. 1041 Ramos;* Tanay, *Merrill 2263:* Province of Tayabas, *Merrill 4014:* Province of Benguet, *Elmer 8955:* Province of Sorsogon, *Elmer 7310.* NEGROS, *Copeland.* SAMAR, *Merrill 5231.* LEYTE, *Elmer 7297.* MINDANAO, District of Davao, (*Warburg 14585*), *Copeland 469.*

Endemic.

2. **P. bracteosum** K. Schum. l. c. 123.

A small loosely tufted plant 1 m tall. Leaves glabrous, long-petioled, the petiole 40 cm long, the knee 4 cm long, the lamina ovate or elliptic, subacute, 30 cm long, 15 cm wide. Peduncle 30 to 45 cm long. Spikes three or four, oblong, 5 cm long or more, about 3 cm apart. Bracts linear-oblong, 3 to 4 cm long, pale. Flowers in pairs, shortly pedicelled. Bracteoles keeled and hairy. Ovary trilocular, thickly hairy. Sepals very narrow, linear-lanceolate, acute, 10 mm long. Corolla-tube rather thick, 1.5 cm long, hairy, the lobes short, rounded. Capsule 1- to 3-seeded, obliquely ellipsoid or rounded, 3-angled, appressed-villous. Seeds 7 mm long, smooth, yellow, the aril bilobed.

LUZON, Province of Camarines, (*Cuming 1466*): Province of *Albay,* (*Vidal 3976*). MINDANAO, District of Davao, (*Warburg 14615*): Lake Lanao, *Mrs. Clemens 423.* SAMAR, *Merrill 5206, 5232.* LEYTE, *Elmer 7294;* (*Cuming 1756*).

Endemic.

18. PHRYNIUM Willd.

Tufted herbs with long-petioled ovate or oblong leaves. Inflorescence capitate, produced from the side of the petiole, with a few large outer bracts and containing numerous flowers, solitary or in pairs or threes on short peduncles. Sepals linear or oblong. Corolla-tube a little longer, the lobes oblong or ovate. Lip usually shorter, with a transverse callus, cucullate, short. Ovary trilocular. Seeds 1 to 3, ellipsoid, triangular, with a thin dry aril.

Species 12, Indo-Malayan.

1. **P. philippinense** Ridl. in Elm. Leafl. Philip. Bot. 2 (1909) 570.

Whole plant about 1 m tall, the rhizome thick, with stout roots emitting many fibrils. Base of sheaths silky, the leaf-stalk to the flower head up to 50 cm long, stout, hairy, above the inflorescence 20 cm long, the lamina 30 to 40 cm long, 15 cm wide, glabrous, oblong-elliptic. Capitulum large, 3 cm thick in flower, 5 cm in fruit. Bracts oblong, ribbed, soon breaking into fibrils at the tip. Bracteoles similar. Flowers white and pink, in pairs, shortly (1 mm) stalked. Ovary silky. Sepals linear, acute, closely ribbed, hairy only at the tip, longer than the corolla-tube.

Corolla-tube dilated upward, the lobes obovate, spathulate, hairy at the tip. Staminodes thin, rounded, obtuse. Cucullus small, side-lobe linear-oblong. Anther very short, the connective wing large, subtriangular. Lip small, oblong, truncate, almost quadrate, the crest large, semiovate, the longitudinal ridge silky. Capsule oblong, red, 1 cm long, hairy. Seeds nearly 1 cm long, obscurely rugose-tubercled.

LEYTE, Palo, *Elmer 7289*. NEGROS, Gimagaan River, *Whitford 1658*. MINDANAO, District of Davao, Todaya, *Copeland 1248*. MINDORO, Alag River, *Merrill 6132*; Baco River, *McGregor 314, For. Bur. 6780, 12103 Merritt*. BATAN, *Bur. Sci. 6260 Robinson*. LUZON, Province of Isabela, Casiguran, *Bur. Sci. 3100 Mearns:* Province of Tayabas, *Whitford 634*. CAMIGUIN, Babuyanes Islands, *Bur. Sci. 3936 Fénix*.

This species is most nearly allied to *P. malaccense* Ridl. of the Malay Peninsula, differing in its more glabrous leaves, nearly glabrous sepals, and in the form of the lip. It has been confused with *P. capitatum* Willd., a Chittagong plant which has purple, sessile flowers.

Endemic.

19. **MONOPHRYNIUM** K. Schum.

Tall herbs, the leaves long-petioled. Panicles numerous, from a leaf-sheath, peduncled. Spikes narrow, fascicled, densely imbricate. Bracts small. Flowers solitary in each bract, with a two-keeled prophyll and mesophyll. Sepals small, lanceolate. Corolla-tube as long, the lobes lanceolate. Outer staminodes 2, obovate, a little longer than the corolla-lobes. Cucullus much shorter, with a subauricled appendage. Ovary 3-locular, with ovules in all the loculi.

Species 3, endemic.

1. **M. fasciculatum** K. Schum. in Pflanzenreich 11 (1902) 68.
Calathea fasciculata Presl Rel. Haenk. 1 (1827) 108, *t. 16, f. 1.*
Phrynium fasciculatum Horan. Monogr. (1862) 11.

Two meters tall. Leaves oblong or subovate-lanceolate, attenuate-acuminate, base rounded, glabrous on both sides, 30 cm long, 8 cm wide; petiole 20 cm long, the upper part 4 cm long, flattened, glabrous. Panicles 3 or 4, subsessile, or with an 8 cm long peduncle, the racemes narrow, 6 cm long. Bracts 10, ovate-oblong, obtuse, 9 mm long, glabrous. Ovary silky. Sepals lanceolate, 4 mm long. Corolla-tube 3.5 mm long, the lobes 5 mm long.

LUZON, (*Haenke*); (*Warburg 14068*): Province of Tayabas, (*Warburg 12921*), *Elmer 9148*.

Halmaheira.

2. **M. simplex** Elmer Leafl. Philip. Bot. 1 (1908) 276.

A tufted plant 1 to 1.5 m tall, glabrous. Leaves thin, elliptic, cuspidate, 18 to 20 cm long, 7 cm wide, base cuneate, the upper surface glabrous, beneath strigose on the nerves, knee 1 cm long, the petiole 50

cm long, rather slender above. Inflorescence of two or three 9 to 12 cm long branches on a peduncle about 15 cm long, yellowish- or grayish-hairy when young, becoming subglabrous. Bracts 1 to 2 cm long, lanceolate, obtuse. Flower spikes remote, 4 to 6 on a branch, the outer bracts lanceolate, 1 cm long, glabrous. Peduncle short, at first erect, afterwards decurved, pubescent. Calyx 3-lobed, lanceolate, acuminate, tip blunt, pubescent. Corolla white, longer, segments ligulate. Staminodes obovate, petaloid, obliquely truncate, a little longer, spotted. Cucullus short, rigid. Capsule 8 mm, roundly triangular, apex truncate, 3-celled, 3-seeded, the seeds angled, truncate, with a thin aril.

LUZON, Province of Tayabas, Lucban, *Elmer 9147, 7611.*

3. **M. congestum** sp. nov.

About 1 m tall, tufted. Leaves thin, lanceolate, acuminate, cuspidate, base cuneate, glabrous on the upper surface, hairy beneath, 30 cm long, 6 cm wide; petiole slender above, 55 cm long including the sheathing portion, pubescent. Inflorescence extruded at two-thirds the distance from the base, a dense head of small spikes about 2 cm in diameter. Peduncles 1 cm long, slender, angled. Bracts lanceolate, hairy, with a tuft of long hairs at the tip. Inner bracts short, oblong, obtuse. Sepals oblong-lanceolate, blunt, ciliate at the tip, half as long as the corolla-tube. Corolla-tube cylindric, the lobes as long, linear-oblong, obtuse. Lip obovate, clawed, the limb oblong-obovate, rounded, entire, with a rather large, semiovate, transverse ridge. Cucullus subspathulate, side lobe decurved, blunt, spotted. Stamen spathulate, the apex dilated into two wings. Style thick, the apex bent an angle and with a thick process at the bend.

LUZON, Provinces of Laguna-Tayabas, from Paete to Piapi, *For. Bur. 9548 Curran.*

Easily distinguished by its inflorescence, and allied to a Bornean species.

MARANTA Linn.

Maranta arundinacea Linn., the arrow-root, is cultivated in the Philippines, being locally known as *Arourów.*

CANNACEÆ.

20. CANNA Linn.

Rhizome perennial. Stems simple, leafy. Leaves large, ovate or lanceolate, acute. Raceme terminal, simple or branched. Bracts small, ovate. Flowers in pairs. Sepals three, lanceolate to oblong. Corolla-tube cylindric, short, the lobes 3, equal, lanceolate. Staminal-tube cylindric, short, the segments petaloid, unequal, a one-celled anther attached to one lobe. Ovary 3-celled, many-ovuled. Style adnate at the

base to the staminal tube, free above, linear-oblong. Capsule oblong or globose, echinate. Seeds large, globose, exarillate.

Species 20 or 30, tropical American, a few species now widely dispersed in the tropics of the World in a half-wild condition. I doubt if any of the species of the genus are indigenous to the Old World. *Canna indica* Linn. occurs all over the tropics near villages, and similarly met with, but less abundant, are *Canna edulis*, *C. glauca*, and *C. Warszewiczii*.

1. **C. indica** Linn. Sp. Pl. (1753) 1, in part: Roxb. As. Research. **9:** 322; Fl. Ind. 1 (1820) 1.

C. orientalis Rosc. Monandr. Pl. (1828) *t. 12.*

Stems 1 to 2 m tall. Leaves ovate or lanceolate, broad, acute or acuminate. Racemes 15 to 25 cm long, the flowers red, in pairs, the pedicels short. Bract thin, oblong, white, truncate, 1 cm long. Bracteoles two, smaller, ovate, acute, thin, white. Calyx lobes three, lanceolate, acute, greenish. Corolla-tube as long. Petals lanceolate, acute, red, about 4 cm long. Staminodes spathulate, unequal, bright-red, 5 cm long, nearly 1 cm wide. Lip recurved, linear-oblong, emarginate or not, 3.5 cm long, red, or with a central yellow band with red streaks. Stamen linear, shorter, about 2 cm long. Style linear, oblong. Capsule oblong.

Luzon, Province of Pampanga, *Bolster 46:* Province of Tayabas, *Whitford 551:* Province of Bataan, *For. Bur. 2012 Borden:* Manila, *Merrill 60.* Batanes Islands, *Bur. Sci. 3715 Fénix.* Negros, *For. Bur. 5237 Everett.* Palawan, *Bur. Sci. 231 Bermejos.* Mindanao, Lake Lanao, *Mrs. Clemens 188.*

2. **C. glauca** Rosc. Monandr. Pl. (1828) *t. 13.*

Stem 1.5 to 2 m tall. Leaves lanceolate, acuminate, margined with white. Inflorescence branched, with long glaucous sheaths on the branches. Bracts glaucous, broadly ovate, thin. Calyx-lobes oblong, rounded, 1 cm long. Corolla-tube as long, the lobes linear, acute, nearly 5 cm long, yellow. Staminodes oblong, dilated a little upward. Lip oblong, cuneate, retuse, 6 cm long, 1 cm wide, yellow, with faint reddish splashes. Stamen linear, nearly 3 cm long. Style linear, equally long. All yellow.

Manila, *Merrill s. n.*, with *C. indica*, but rarer.

MUSACEÆ.

21. **MUSA** Linn.

Tall herbs with broad, oblong leaves of great size; sheaths very large, enwrapping each other. Inflorescence terminal, racemose, with large, ovate bracts. Flowers unisexual, the females at the base, the males at the apex, in short half-circles on a stout rachis. Calyx tubular, 3- to 5-toothed, split down one side. Corolla as long, tubular. Stamens 5, perfect, the sixth rudimentary or absent. Filaments filiform. Anthers

erect, linear, 2-celled. Style filiform. Stigma capitate, 6-lobed. Fruit an oblong, fleshy, trigonous or cylindrical many seeded berry.

Species 35, tropics of the world.

There are no specimens of any species in the collection I have received, although many forms of *Musa sapientum* Linn. and *M. paradisiaca* Linn., occur in the Philippines in cultivation, and doubtless some endemic species other than the following, the well-known Manila Hemp plant, *Musa textilis*, which I here describe from plants cultivated under that name in the Botanic Gardens at Singapore.

M. textilis Née Ann. Cienc. Nat. 4 (1801) 123; K. Schum. Pflanzenreich 1 (1900) 19.

M. mindanensis Miq. Fl. Ind. Bat. 3 (1855) 588.

M. sylvestris Colla Mém. Gen. Musa (1820) 58.

M. troglodytarum var. *textoria* Blanco Fl. Filip. (1837) 247.

M. abaca Perr. Mém. Soc. Linn. Par. 3 (1824) 130.

Stems tufted, cylindric, about 6 m tall, and 19 cm in girth. Leaves narrowly linear-oblong, cuspidate, 3 m long, 30 cm wide, nerves conspicuous, parallel, light green on both sides; petiole long. Spike pendulous. Bracts lanceolate, obtuse, 20 cm long, 8 cm wide at the base, coriaceous, dull-brownish-red. Bud acute. Female flowers in three or four half-whorls, two rows in each whorl. Male flowers very numerous, in double whorls, 6 flowers in one series, 3 in the other, white; outer perianth-lobe 3 cm long, stiff, yellowish-white, base yellow, with three cuspidate teeth, recurved; inner thinner, saccate, pure white, 2 cm long, apex truncate, with two denticulate lobes at the corners. Stamen-filaments linear, white, 2 cm long. Anther a little shorter, linear, cells brownish. Fruit subcylindric, narrowed at both ends. Seeds globose, flattened, small.

Philippines.

Musa coccinea Andr. is cultivated as an ornamental plant the entire inflorescence cardinal-red, (Negros, Dumaguete, *Elmer 7836*), a native of southern China and Cochinchina.

Ravenala madagascariensis J. F. Gmel. the "traveller's palm" is cultivated for ornamental purposes in Manila.

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VOL. IV AUGUST, 1909 No. 3.

THE GENUS ERIA IN THE PHILIPPINE ISLANDS.*

By ROBERT GREENLEAF LEAVITT.

(*From the Ames Botanical Laboratory, North Easton, Mass., U. S. A.*)

Forty species of *Eria,* all but six of which are thought to be endemic, have thus far been discovered in the Philippine Islands and are described below. They are distributed in seven sections, § *Urostachya* being most fully represented, with § *Hymeneria* second in number of species.

Only thirteen of these Erias were known to science when, within a decade or so, the present botanical activity began, the remaining twenty-seven being, therefore, all recent or new. Thirteen species are described for the first time in the present account. These facts arouse the expectation that in the immediate future a large number of new species will be brought to light in the extensive districts which, botanically, are as yet virgin territory. Many exotic kinds will also doubtless be found. With the increase of material and the more enlightened study which it will permit, groups now thought to be integral species will reveal a definite multiplicity. As a result of these several modifying causes, the genus of only a few years hence will doubtless wear a quite different aspect from that of the Philippine *Eria* of to-day; and the present summary will very shortly appear fragmentary and out of date. Without doubt it embodies mistakes incidental to a paucity of materials. It is attempted with the purpose of promoting the study of the group by collectors, and is prepared in view of the fact that, at the moment of writing, there is in existence no general treatment of the genus *Eria.* I have hoped to lighten the

* Contributions from the Ames Botanical Laboratory, No. 10.

labor of identifying new collections in a group of some hundreds of species, whose descriptions are widely scattered in literature, in which identification has ordinarily been very difficult or even, except under favorable conditions as regards library and herbarium, impossible.

MISCELLANEOUS NOTES, DIAGNOSES OF NEW SPECIES, ETC.

Before undertaking the consecutive description of the species, I may enter certain notes which have been made in my study of the genus; here, also, I have placed the required Latin characterizations of new species, citations of specimens, original descriptions, the bibliography of old species, etc.

Measurements in diagnoses of new species are taken from dried specimens. When single measurements are given they are maxima rather than averages. Leaf-lengths do not include sheathing bases. Lengths of racemes are exclusive of the peduncle. The height of the column is generally taken without the anther-cap. Drawings are invariably from the camera lucida.

ERIA Lindley.

"*Perianthium* lanatum, connivens. *Labellum* trilobum, articulatum cum processu unguiformi columnae cujus lateribus sepala antica adnascuntur. *Pollinia* octo." Lindley Bot. Reg. (1825) *t. 904.*

"*Sepala* subaequalia, *posticum* liberum v. basi breviter rarius alte cum caeteris connatum, *lateralia* saepius latiora basi pedi columnae adnata, mentum breve v. rarius calcariforme formantia, superne libera v. rarius altius connata. *Petala* sepalo postico subconformia. *Labellum* ad apicem pedis columnae basi contractum, rarius articulatum, incumbens, superne patens, integrum v. utrinque lobo laterali auctum. *Columna* brevis, lata, antice cava saepeque anguste 2-alata, basi in pedem producta; clinandrium margine integrum v. vix antice 2-angulatum et postice 1-dentatum. *Anthera* terminalis, opercularis, incumbens, interdum valde convexa v. obtuse conica, loculis 2 distinctis imperfecte 4-locellatis; *pollinia* 8, cerea, in quoque loculo 4, pyriformia v. late ovoidea, parum compressa, acutiuscula v. acuminata, in fasciculos 2 visco parco cohaerentia. *Capsula* oblonga v. linearis, erostris.—*Herbae* epiphyticae v. rarius terrestres, caulibus secus rhizoma saepius confertis pseudobulbosis, v. longiusculis saepe carnosis 2–∞-foliatis, v. rarius 1-foliatis. *Pedunculi* v. *scapi* pseudoterminales v. laterales, nec directe rhizomati affixi, simplices, racemiferi v. interdum 1-flori. Flores parvi mediocres v. rarius majusculi, secus rhachin racemi sparsi v. rarissime distichi. *Bracteae* parvae v. angustae." Bentham & Hooker Gen. Pl. **3** (1883) 509.

§ **UROSTACHYA** Lindley in Journ. Linn. Soc. Bot. **3** (1859) 60; Bentham l. c. **18** (1881) 303; Bentham & Hooker Gen. Pl. **3**: 510; Pfitzer in Engler & Prantl Nat. Pflanzenfam. 2^6 (1889) 175; J. J. Smith Orch. Java 398.

"The *caulescent* species with numerous *leaves,* and long *racemes* or *panicles* of flowers, without the woolly lip-appendages of § *Eriura,* form

a natural group which may be conveniently placed apart from others. The *flowers,* with the exception of *E. bambusifolia,* are very small and densely arranged." Lindley, *l. c.*

This section is perhaps not strictly separable from § *Hymeneria,* to which, indeed, Hooker f., for the Indian flora, joins it; but in the Philippines the division is a convenient one, since it quickly indicates the general nature of the species embraced, which in these Islands are relatively numerous.

E. polyura Lindley Bot. Reg. (1841) Misc. 55; Ames Orchidaceae 1 (1905) 95; 2 (1908) 196.

"*Caule* elongato folioso, *foliis* lanceolatis acutis patentibus striatis, *spicis* oppositifoliis multifloris nutantibus foliis aequalibus v. brevioribus, *bracteis* ovario duplo brevioribus adpressis, *sepalis petalisque* ovatis acutis erectis laevibus, *labello* cordato ovato acuto basi bicarinato." Lindley, l. c.

The type in Lindley's herbarium is labeled "Loddiges June 1841." It was originally from the Philippines. It consists of two racemes merely. The accompanying camera lucida drawing (fig. 2, below) represents a rather poor, but sufficiently serviceable flower from one of these racemes. The dotted lines restore the true outline of shriveled or defective parts. On the same sheet with the type is a Cuming specimen (for which Mr. Rolfe suggests the number 2128, the type number of *E. ringens* Reichb. f.) from the Philippines, marked "*E. polyura*" in Lindley's hand, which in reality is a very different plant indeed. The flowers have no resemblance to those of *E. polyura*—the lip is trilobed, the perianth-segments very narrow and acuminate—nor do the stem and its sheaths particularly recall those of this species.

LUZON, Province of Tayabas, Mount Banajao, *Elmer 7393,* May, 1906, epiphytic, in open ravines at 600 m altitude: Province of Cagayan, *For. Bur. 11320 Klemme,* April, 1908.

E. Copelandii sp. nov.

E. Hutchinsonianae affinis. *Sympodium* productum. *Caulis* in sicco 2–4 mm in diametro, vaginis laxis instructus. *Folia* prope apices caulium conferta, in caule florigero 5, lanceolata, acuta, 9–13 cm longa, 7–12 mm lata. *Inflorescentiae* 2, plus minus 7 cm longae, *pedunculo* plus minus 1 cm longo, *racemo* dense plurifloro, plus minus 1 cm in diametro, *bracteis* ovatis vix 2 mm longis. *Flores* parvi, sessiles. *Ovarium* pubescens, 1–2 mm longum. *Sepala* 3–4 mm longa; *dorsale* ellipticum, concavum; *lateralia* impariter ovata obtusa, 2.5 mm lata. *Petala* oblonga vel ovata, obtusa, concava, plus minus 3 mm longa. *Labellum* integrum, saccatum, explanatum semiorbiculare, vix 3 mm longum. *Columna* crassa, 1 mm alta; *pes* aequilongus. (Fig. 3.)

The small globose flowers with entire saccate or scoop-like smooth-margined lip are distinctive.

MINDANAO, District of Davao, Mount Apo, *Copeland 1423* (type, part in Manila, part in herb. Ames), epiphytic, flowers rose-colored, with faint odor. *For. Bur. 4600 Mearns & Hutchinson,* collected at an altitude of 2,800 m on Mount Malindang, Province of Misamis, Mindanao, May, 1906, has leaves and inflorescence shorter than in the type, but the floral structure is the same; *For. Bur. 4596* from the same locality, the "flowers yellow," specimens in fruit, may be the same.

I may or may not be right in combining with the several specimens cited above the following which is of an aberrant habit, yet has the flowers of the species. Its most noticeable peculiarity is the pseudobulbous thickening of the stem, that is of the extremity of each member of the sympodium.

Var. **fusiformis** var. nov.

Apices caulium per internodia plurima incrassati, *pseudobulbos* formantes fusiformes, 3–4 cm longos, plus minus 1 cm crassos, *vaginis* imbricatis acuminatis vestitos, florigeros, et ad apicem foliosos; *racemi* densiores.

Luzon, Province of Benguet, Mount Tonglon, *For. Bur. 5067 Curran,* (type), August 8, 1906, epiphytic in top of tree, flowers white with pink center. *Merrill 4590,* from an altitude of 2,100 m on Mount Data, District of Lepanto, Luzon, November, 1905, is somewhat peculiar, but at present is to be placed here.

E. Hutchinsoniana Ames in Philip. Journ. Sci. 2 (1907) Bot. 330.

"Allied to *E. tenuifolia* Ridl. *Rhizomes* woody, about 5 mm in diameter. *Pseudobulbs* 5 cm–1 dm apart, abbreviated, 1.5–3 cm long, clothed with scarious sheaths, leafy at the summit. *Leaves* linear-lanceolate, about 1 dm long, about 8 mm wide, acute, tapering gradually toward both ends. *Inflorescence* few-flowered, about 6 cm long, near the summit of the pseudobulbs. *Flowers* white and purple. *Peduncle, pedicels,* and *ovaries* covered with rufous or dark yellowish hairs. *Bracts* lanceolate, acute, about 4 mm long, about 1.5 mm wide. *Lateral sepals* triangular-lanceolate, acute, slightly protuberant anteriorly at base near the apex of the column foot, about 8 mm long, 2.5 mm wide near the middle, broader below. *Upper sepal* lanceolate, acute, about 9 mm long, narrower than the laterals. *Petals* linear-lanceolate or linear-oblong, subobtuse, 3-nerved, about 8 mm long, 2 mm wide near the middle. *Labellum* ecallose, smooth, 5 mm long, basal half with the sides erect (conduplicate when dry), apical half oblong, rounded at the apex, 2 mm wide."

E. philippinensis Ames Orchidaceae 1 (1905) 94.

"*Rhizoma* repens. *Pseudobulbi* remoti, foliati. *Folia* lineari-oblonga s. lineari-lanceolata, acuta, 12 cm longa, approximata. *Racemus* nutans. *Rhachis* puberulus. *Sepala lateralia* oblonga, acuta. *Sepalum dorsale* oblongum. *Petala* oblonga sub-acuta. *Labellum* integer, ovatum, obtusum, ecallosum. *Ovarium* tomentosum. *Flores* glabri.

"*Rhizome* woody, stout, creeping, bracteate. *Bracts* tubular, loosely imbricating, obtuse. *Leaves* about 5, linear-oblong or linear-lanceolate, acute, about 12 cm long, 11 mm wide, approximate upon remote, declined, pseudobulbous, contracted, thickened stems; each pseudobulbous stem subtended by a leaf. *Racemes* several from the summit of the short stems, about 1 dm long, loosely many-flowered, tomentose. *Bracts* longer than the tomentose pedicels, smooth. *Flowers* exceeding 1 cm in length, smooth. *Lateral sepals* oblong, acute, about 1.5 cm long, 4 mm wide. *Upper sepal* narrower than the laterals, about 1.5 cm long. *Petals* oblong,

sub-acute, 1.4 mm long, 4 mm wide. Lip entire, ovate, obtuse, ecallose, 7 mm long. *Column* 2.5 mm high. *Ovary* tomentose hairy."

LUZON, Province of Bataan, Mount Mariveles, *For. Bur. 2206 Meyer*, November 22, 1904, terrestrial, flowers odorless, petals cream-color, lip dark-red, common, altitude 760 m; *For. Bur. 2322 Borden*, December, 1904: District of Lepanto, Mount Data, *Merrill 4859*, October 29, 1905, epiphytic in the mossy forest, altitude 2,125 m, flowers pale-dull-purple; trail to Balbalasan, *For. Bur. 5729 Klemme*, November 19, 1906, flowers pink; same place and date, flowers white, *For. Bur. 5732 Klemme:* Province of Benguet, Pauai, *Bur. Sci. 4318 Mearns*, July, 1907, altitude 2,100 m.

E. Woodiana Ames in Philip. Journ. Sci. **2** (1907) Bot. 332.

"Allied to *E. ovata* Lindl. *Stems* about 18 cm long, leafy at the summit, closely sheathed. *Leaves* oblong-lanceolate, up to 3 dm long, 3–4.5 cm wide, acute. *Inflorescence* racemose, much shorter than the leaves. *Flowers* pale yellow. *Peduncles* about 1 dm long, floriferous nearly to the base, breaking forth from the leafy summit of the pseudobulbs. *Bracts* ligulate, acute, about 5 mm long. *Lateral sepals* oblong-lanceolate, acute, 6 mm long, 2 mm wide. *Upper sepal* narrowly lanceolate, 6.5 mm long. *Petals* narrowly lanceolate, subacute, 5.5 mm long, 1.5 mm wide. *Labellum* 3-nerved, about 4 mm long, orbicular at base, contracted at about the middle into the oblong, obtuse, apical half, monocallose at base in front of the claw."

E. longicruris sp. nov.

Caules cylindracei, vaginis tubularibus vestiti, ad 30 cm alti, in sicco 2 mm in diametro, ad summum per distantiam 3–5 cm foliosi. *Folia* lanceolata, acuminata, acuta, lamina ad 15 cm longa, 1–1.5 cm (rarissime 2 cm) lata. *Inflorescentiae* 2 vel 3, oppositifoliae, laxiflorae, 5–9 cm longae; pedunculus brevis, cum rhachide glabro pergracilis. *Bracteae* acuminatae, acutae, plus minus 6 mm longae. *Flores* plus minus 15, glabri. *Ovarium* cum pedicello pergracile, ad 15 mm longum. *Sepalum dorsale* a basi regulariter fastigatum, vel aliquantum lanceolatum, acutum, 11–13 mm longum, 2–3 mm latum ad basim. *Sepala lateralia* similia, parum falcata, intermedio aequilonga. *Petala* ligulato-lanceolata, acuta, sepalis aliquanto breviora et angustiora. *Labellum* brevissime unguiculatum, 3-lobatum, plus minus 6 mm longum; *pars basilaris* rotundata, plus minus 4 mm lata, carinis tribus, medio crasso, canaliculato; *lobi laterales* incurvati, breves, obtusi; *lobus medius* oblongo-obovatus, plus minus 3 mm longus, 1.5–2 mm latus. *Columna* gracilis, ferme 3 mm alta; *pes* 2 mm longus. (Fig. 6.)

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4609 Mearns & Hutchinson*, June 4, 1906, part in Manila, part in herb. Ames. Altitude 2,800 m. Flowers yellow-white.

E. graciliscapa Rolfe ex Ames Orchidaceae **1** (1905) 93; **2** (1908) 193; **3** (1908) 88, *t.* 57.

"*Pseudobulbs* terete, slender, 5–6 inches long. *Leaves* 3 or 4, terminal, lanceolate-oblong, subcoriaceous, $2\frac{1}{4}$–$3\frac{1}{4}$ inches long, 6–8 lines broad.

Scapes axillary near the summit of the stems, slender, arcuate, many-flowered, 2½–3 inches long. *Bracts* oblong-lanceolate, acute or acuminate, 1–1¼ lin. long. *Sepals* oblong-lanceolate, acuminate, 2¼ lin. long. *Petals* lanceolate-linear, acuminate, 1¾ lin. long. *Lip* entire, ovate-lanceolate, acute, strongly 3-nerved, 1 lin. long. *Column* rather stout, about ¾ lin. long. Mentum very short." Rolfe *l. c.*

Luzon, Province of Tayabas, Mount Banajao, *Elmer 7405*, May, 1906, a tufted epiphyte, flowers yellowish, altitude 600 m.

The following species is described from a single plant, originally confused with *E. longicruris* on one of the sheets above cited:

E. racemosa sp. nov.

Caulis cylindraceus, in sicco plus minus 5 mm in diametro, vaginis papyraceis laxis tubularibus aliquid oblique truncatis 5 cm longis vestitus. *Folia* 7, ad summum caulem conferta, *laminis* lanceolatis, ad 12 cm longis et 1.7 cm latis, obtusiusculis. *Inflorescentiae* 4, oppositifoliae, ad 14 cm longae, *pedunculo* breve, validiusculo, *racemo* laxe plurifloro, plus minus 2 cm in diametro, *bracteis* 5 mm longis. *Ovarium* cum pedicello pergracile, pubescens pilis rufis, plus minus 7 mm longum. *Mentum* breve. *Sepala* ligulata, obtusa, 8–9 mm longa, *dorsale* aliquid lanceolatum, 2 mm latum, *lateralia* falcata, 2.5 mm lata. *Petala* ligulata, obtusa, 7–8 mm longa, 1.5 mm lata. *Labellum* ovato-oblongum, plus minus 4 mm longum, 2 mm latum ad basim rotundatum; calli 3, carinati, duo prominentes 1 mm a basi labelli, inter eos unus humilis super venam mediam. *Columna* gracilis, 1.5 mm alta, *pedi* aequilonga.

Type specimen found upon sheet with *Eria longicruris*, collected by *Mearns & Hutchinson* on Mount Malindang, Province of Misamis, Mindanao, May, 1906, *For. Bur. 4609*.

Cuming's collections in the Philippines gave in the hands of Reichenbach f. and of Lindley two or perhaps three species in this section. The descriptions are highly inadequate. What Reichenbach's *Eria ringens* is, can not certainly be known until his type can be seen, if it is still in existence when his herbarium is opened. Cuming's no. 2128 is to be found in several herbaria, but it may possibly have been originally a mixture, since confusion is easy in a group like this. Reichenbach says[1] that his species is repeated in Lindley's *Eria retroflexa*.

E. retroflexa Lindley in Journ. Linn. Soc. Bot. 3 (1859) 60; Ames Orchidaceae 2 (1908) 197.

"Foliis anguste oblongis *spicis* tenuibus duplo longioribus, *bracteis* oblongis glabris retroflexis, *floribus* glabris, *sepalis petalis labelloque* subaequalibus ovatis acutis." Lindley *l. c.*

Fortunately the type of this species is accessible in the Lindley herbarium. I have taken a careful camera lucida drawing from a flower, which is reproduced below (fig. 7). The floral structure disagrees very essentially with Lindley's drawing on the sheet, and with the original description, which was written, I suspect, at second hand, that is from the erroneous drawing rather than from the flowers of the plant itself. Such a labellum as Lindley ascribes to *Eria*

[1] Linnaea 41:87.

retroflexa (scarcely distinguishable from the other perianth-segments) would be wholly anomalous in the alliance. In reality, the lip, compared with the other segments, is very small. The following are approximately the dimensions of the parts of the flower examined by me: sepals 8–8.6 mm long, 2 mm broad; petals 6.4 mm long, 1.7 mm broad; lip 3.4 mm long, 2 mm broad. The lip is thick and apparently callose on the sides near the base. The specimen, accompanied by the usual Cuming label but without number, consists of a single stem (about 1 cm in diameter near the top, in the dry state) bearing up and down its sides 5 inflorescences, the longest about 9 cm long and near the summit two leaves, the largest about 17 cm long, and 1.8 cm wide.

LUZON, Province of Tayabas, *Whitford 812*, September 11, 1904, epiphytic, flowers white.

Eria ringens Reichb. f. in Bonplandia 3 (1855) 222; Lindley in Journ. Linn. Soc. Bot. 3 (1859) 55; Reichb. f. in Walp. Ann. 6:275 and in Linnaea 41 (1876) 87; Hook. f. Fl. Brit. Ind. 5:793; Grant Orch. Burma 148.

"Aff. *Eriae pubescenti* Wight, glabra, *bracteis* ovatis acutis, *labelli* ungue brevissimo, lamina oblonga acuminata basi rotundata, *gynostemii* androclinio utrinque semiovato brachiato, angulis anticis medio omnino muticis. *Caulis* carnosus bulbosus (cylindraceus ? planus ?), siccus dimidium pollicem latus. *Folia* oblongoligulata basi cuneata, apice inaequali acuta, tres quatuorve pollices longa, unum pollicem lata. *Spicae* oppositifoliae duos tresve pollices longae, plurifiorae. *Bracteae* duas tresve lineas longae apiculatae reflexae ovariis pedicellatis subaequales. *Perigonia* longiuscula (tres lineas longa); glaberrima. *Mentum* obtusum. *Sepala* et *tepala* lancea acuta ! 2128. Cuming. Phil." Reichb. f. in Bonplandia *l. c.*

E. merrittii Ames in Philip. Journ. Sci. 2 (1907) Bot. 331.

"*Pseudobulbs* rather stout, cylindrical from a stout rhizome, 7–10 cm long, about 5 mm thick, 2–3-leaved at the summit. *Leaves* linear-lanceolate, about 12 cm long, about 1.5 cm wide, acuminate, acute. *Peduncle* short, about 4 cm long, breaking forth from the upper part of the pseudobulbs. *Bracts* lanceolate, acute. *Flowers* white. *Lateral sepals* linear-lanceolate, acute, about 6–7 mm long, 1.5 mm wide at base. *Upper sepal* linear-lanceolate, about equal to the laterals. *Petals* narrowly lanceolate, acute, about 6.5 mm long, 1.5 mm wide, 3-nerved, acute. *Labellum* lanceolate, ecallose, smooth, 4 mm long, 1.5 mm wide at base."

This species very much resembles *Eria retroflexa* Lindl.

E. ovata Lindley Bot. Reg. (1844), sub *t. 29;* Vidal Phan. Cuming. Philip. 149 and Rev. Pl. Vasc. Filip. 268; Ames Orchidaceae 2 (1908) 195 (excl. specimen cited which belongs to *E. Elmeri*, I think.).

"*Foliis* oblongis obtusis basi angustatis, *racemis* pubescentibus multifloris, *bracteis* parvis ovalibus reflexis, *sepalis petalisque* acuminatis, *labello* ovato-oblongo indiviso basi bicalloso." Lindley *l. c.*

The type in Lindley's herbarium at Kew is an unnumbered Cuming specimen from the Philippines, consisting of three leaves and one inflorescence. There is a drawing of the lip by Lindley showing the two short carinate calli very near

the base, which my camera drawing from the type, reproduced below (fig. 8), does not show. The longest *leaf* is 9 cm long by 2 cm broad, and the *raceme* is 14 cm long. The *sepals* are 1 cm long by 4–4.5 mm broad, and the *petals* are of the same dimensions; the *lip* is 6 mm long, 3.5 mm broad; the *column* excluding the anther is 2 mm high, its *foot* 2.3 mm long, and the *ovary and pedicel* 1 cm long; the *floral bracts* are broadly lanceolate, acute, the lower about 5 mm long. My notes say that all parts of the lip are thin and veiny. The ovary is rather densely pubescent with short brownish or tawny hairs. My camera drawing is from Lindley's type.

E. Elmeri Ames Orchidaceae 1 (1905) 93; 2 (1908) 196.

"*Caules* elongati, 2 dm longi. *Folia* coriacea, elliptico-oblonga, obtusa, 5–8 cm longa. *Racemus* nutans, rhachis puberulus. *Sepala* similia, oblonga, obtusa, trinervia. *Petala* oblonga, obtusa. *Labellum* ovato-lanceolatum, sub-acutum s. obtusum, ad basim bicallosum. *Flores* glabri.

"*Plants* about 2 dm high ? *Stems* rather stout, leafy above, 5–7 mm thick. *Roots* branching, villose-pubescent. *Leaves* about 7 in number, approximate near the summit of the stem, coriaceous, elliptic-oblong, obtuse, 5–8 cm long, up to 3 cm wide, many-nerved, shortly petiolate. *Racemes* several, slender, flexuous, about 1 dm long, from the summit of the stems, many-flowered. *Rhachis* sparsely pubescent. *Floral bracts* conspicuous, oblong, sub-acute, about 6 mm long. *Pedicels* about 5 mm long, slender. *Sepals* similar, oblong, obtuse, 6 mm long, 3-nerved. *Petals* shorter than the sepals, oblong, obtuse. *Lip* 3-nerved, articulated with the foot of the column by a short oblong claw, purplish, narrowly ovate, subacute or obtuse, 3 mm long, 1.5 mm wide just above the claw, with two short, keel-like intramarginal calli, one on each side near the base of the expanded limb. *Column* 1.5 mm long, produced into a distinct foot. *Pollinia* 8. *Flowers* yellowish or whitish with a purple-stained lip." Ames Orchidaceae **1** (1905) 93.

Luzon, Province of Bataan, Lamao River, Mount Mariveles, *Whitford 161, 1117*, May, 1904, March 3, 1905. Epiphyte, flowers yellow, common on ridges, altitude 1,000–1,500 m.

E. compacta Ames in Philip. Journ. Sci. **2** (1907) Bot. 329.

"*Roots* elongated, much branched. *Pseudobulbs* approximate, elongated-pyriform, about 5 cm long, about 1 cm in diameter at base, bifoliate. *Leaves* rigid, coriaceous, oblong-lanceolate, obtuse, 4.5–5.5 cm long, 10–14 mm wide. *Inflorescence* about 3 cm long. *Bracts* ovate-lanceolate, 5 mm long, about 2 mm wide, acute, equaling or exceeding the pedicels of the flowers. *Lateral sepals* triangular-lanceolate, acute, 6 mm long, 2.5 mm wide at base. *Upper sepal* lanceolate, slightly broader than the laterals. *Petals* lanceolate, acute or subacute, about 6 mm long, 2 mm wide, 3-nerved. *Labellum* ovate-lanceolate, subobtuse, cordate at base, 4 mm long, 1.75 mm wide near the base."

The very broad column is distinctive.

E. floribunda Lindley in Wall. Cat. (1832) no. 7408; Bot. Reg. (1843) Misc. 43; (1844) *t. 20;* Paxton's Mag. Bot. **11** (1844) 91; Journ. Hort. Soc. **3** (1848) 15; Josst Beschr. u. Cult. Orch. 91; Paxton's Fl. Gard. **3**:116, *fig. 288* (var. *leucostachya*); Beer Orchideen 247; Miquel Fl. Ind. Bat. **3**:661; Journ. Linn. Soc. Bot. **3** (1859) 60; Walp. Ann. **6**:276; Gard. Chron. N. S. **18** (1882) 468; Hooker f. Fl. Brit. Ind. **5**: 792; Ridley in Trans. Linn. Soc. Bot. II **3** (1893) 366; Grant Orch. Burma 140; Journ. Linn. Soc. Bot. **31** (1896) 281, 282 and **32** (1896) 290; Bull. Herb. Boiss. II 4 (1904) 368; J. J. Smith Orch. Java 400.

Pinalia floribunda O. Kuntze Rev. Gen. Pl. **2** (1891) 678.

"*Caulibus* carnosis subflexuosis teretibus, *foliis* lanceolatis acuminatis, *racemis* oppositifoliis patulis multifloris pubescentibus foliis brevioribus, *bracteis* defloratis ovatis concavis retrorsis, *sepalis* petalis 3-plo latioribus, *labello* angusto nudo basi saccato: laciniis lateralibus ascendentibus abbreviatis intermedia cuneata tridentata.

"A caulescent species, with lanceolate leaves seven or eight inches long. The flowers are small, pink, smooth in close spreading racemes much shorter than the leaves. The column is dark purple at the top." Lindley Bot. Reg. (1843) Misc. 43.

PALAWAN, Balsajan River, Mount Pulgar, *Bur. Sci. 550 Foxworthy,* March 1, 1906, plant 8 dm high, flowers white, on trees on river bank; Mount Victoria, *Bur. Sci. 633 Foxworthy,* April, 1906, epiphyte, flowers white, altitude exceeding 1,000 m above the sea.

§ **HYMENERIA** Lindley in Journ. Linn. Soc. Bot. **3** (1859) 52; Bentham *l. c.* **18** (1881) 303; Bentham & Hooker f. Gen. Pl. **3**:510; Hooker f. Fl. Brit. Ind. **5**:785; Pfitzer in Engler & Prantl Nat. Pflzenfam. 2^6 (1889) 175; J. J. Smith Orch. Java 406.

"This name is proposed for all those species which, to a fleshy somewhat shapeless *stem* with few thin *leaves,* add a many-flowered *inflorescence* that is smooth or nearly so. Possibly it might be subdivided into those with a dense inflorescence like *E. convallarioides* and *pumila,* and such as have the thin racemes of *E. bractescens.*" Lindley *l. c.*

E. bractescens Lindley Bot. Reg. (1841) Misc. 18; (1844) *t. 29;* Paxton's Mag. Bot. **8** (1841) 118; **11** (1844) 116; Gard. Chron. (1841) 231 and N. S. **18** (1882) 468; Walp. Ann. **6**:277; Ridley in Trans. Linn. Soc. Bot. II **3** (1893) 366; Grant Orch. Burma 135; Journ. Linn. Soc. Bot. **32** (1896) 293; King & Pantling Orch. Sik.-Himalaya 120, *t. 166;* Williams in Bull. Herb. Boiss II 4 (1904) 368; J. J. Smith Orch. Amboin. 74; Ames Orchidaceae **2** (1908) 189.

E. Dillwynii Hooker Bot. Mag. (1845) *t. 4163;* Bot. Reg. (1845) Misc. 63; Paxton's Mag. Bot. **12** (1846) 140; Journ. Linn. Soc. Bot. **3** (1859) 55.

"*Pseudobulbis* brevibus ovatis apice subdiphyllis, *foliis* oblongis undulatis racemis subaequalibus, *bracteis* margine revolutis superioribus linearibus reflexis, *racemis* erectis, *labelli* trilobi lamellis duabus abbreviatis intermedia producta lobo medio truncato rugoso obtuse apiculato." Lindley *l. c.*

LUZON, Province of Bataan, Mount Mariveles, *Whitford 1082,* February 13, 1905, epiphyte, flowers creamy-white, odorless, altitude 900 meters. MINDANAO,

Province of Zamboanga, *For. Bur. 5172 Hutchinson*, February 20, 1906, epiphyte, near the sea coast, flowers yellowish-white.

Var. **latipetala** var. nov.

Petala illis speciei latiora, rubro- vel purpureo-tincta. Lobi laterales *labelli* lobo medio majores, rotundati, truncati. (Fig. 12.)

Luzon, Province of Rizal, Mountains back of Bosoboso, *Bur. Sci. 3000 Ramos*, flowering in orchid house at Manila, April 9, 1907.

E. longilabris Lindley Bot. Reg. (1841) Misc. 38; (1842) *t. 29, f. 3.*

"*Eriae bractescentis* facie sed *sepalis petalisque* magis acuminatis, *labelli* trilobi lamellis tribus ad apicem fere productis aequalibus lateralibus abbreviatis lobo medio ovato acuminato.

"A native of Panay in the Philippines, whence it was sent to Messrs. Loddiges by Mr. Cuming. It is very like *Eria bractescens*, but is a finer species, and bears more flowers; and is distinguished at once by its lip, which is not truncate, and has three equal wavy ridges prolonged almost as far as the tip of the middle lobe, which is long and acuminated." Lindley Bot. Reg. (1841), Misc. 38.

In view of the variability of *Eria bractescens* it is doubtful whether *E. longilabris* can be considered to be more than a variety of the former species.

E. Curranii sp. nov.

Affinis *E. bractescenti* sed minor. *Pseudobulbus* cauliformis, cylindraceus, 6 cm longus, in sicco 1 cm crassus. *Folia* 2, lanceolato-oblonga, obtusa, 10 cm longa, 2 cm lata. *Inflorescentia* foliis longior, plus minus 15 cm longa. *Pedunculus* brevis, gracilis. *Racemus* laxiflorus, rhachide sparse pubescente. *Bracteae* plus minus 6 mm longae, amplae. *Pedicellus* cum ovario 1 cm longus, sparse pubescens, pergracilis. *Mentum* conspicuum, oblongum vel conicum, angulum acutum cum ovario formans. *Sepalum* dorsale ovatum plus minus 5 mm longum, plus minus 2.5 mm latum. *Sepala lateralia* triangulari-falcata, acuta, plus minus 5 mm longa, 4 mm lata ad basim. *Petala* oblonga, acuta vel obtusa, 4–5 mm longa, 1.7 mm lata. *Labellum* unguiculatum (ungue curvato), cuneato-obcordatum, *lobo medio* obcordato, 3 mm lato; *lobi laterales* rotundati; totum labellum plus minus 6 mm longum, 4.5 mm ad apices loborum lateralium, fere 4 mm latum, carinis duabus majusculis in disco, media minore. *Columna* 2 mm alta, *pes* 4 mm longus. (Fig. 13.)

Palawan, *For. Bur. 3904 Curran*, March, 1906.

E. profusa Lindley Bot. Reg. (1842) Misc. 2.

"*Pseudobulbis* ovalibus apice diphyllis, *foliis* oblongis striatis *racemis* pubescentibus multifloris brevioribus, *bracteis* squamaeformibus pedicellis brevioribus, *sepalis* tomentosis, *petalis* lineari-oblongis obtusis, *labello* trilobo laciniis lateralibus erectis laevibus intermedia subrotunda rugosa apice tuberculato solitario oblongo cristata." Lindley *l. c.*

Lindley attributed this species at first to Ceylon. In Paxton's Magazine 12:46,

however, the plant is said to be a "product of Manila." The type in Lindley's herbarium consists of a bulb, three leaves, and two inflorescences, and is accompanied by Lindley's drawing of the lip and column. A note remarks that the tubercle of the lip does not seem to be present in all cases. I find no record of this plant since the reference in Paxton's Magazine.

Luzon, Province of Rizal, *Bur. Sci. 3079 Ramos,* flowering in orchid house, Manila, February, 1908, flowers pale, with markings of purple and yellow: without locality, *Lyon,* flowers yellow, common at 300–600 m alt. Negros, *For. Bur. 11237 Everett,* April, 1908.

E. cylindrostachya Ames Orchidaceae 2 (1908) 190.

"*Pseudobulbi* 3–7 cm longi, ovoidei, di- vel triphylli ad apicem. *Folia* cum petiolis gracilibus sulcatis 20–36 cm longa, 1–2 cm lata, lineari-lanceolata. *Pedunculus* cum rhachide 9–20 cm longus, aliquid crassus, sparse pubescens, prope apicem pseudobulbi ortus. *Racemus* spicatus, cylindraceus, usque ad 17 cm longus. *Bracteae* ovatae vel ovato-lanceolatae, pedicello ovarioque breviores. *Ovarium* tomentosum tomento rufo. *Sepala lateralia* 7 mm longa, 5 mm lata, late ovata, acuta, pubescentia, mentum obtusum formantia. *Sepalum dorsale* 6 mm longum, 3.5 mm latum, elliptico-oblongum, obtusum. *Petala* 5–6 cm longa, supra medium 3 mm lata, obovata, cuneata. *Labellum* 5–7 mm longum, 3-lobatum ultra medium, ungui 4.5 mm longo, cuneato-oblongo, bicalloso prope basim; *lobi laterales* parvi, quadrati, obtusi, 1.5 mm longi a basi lobi medii; *lobus medius* rotundus, 2 mm longus, 3 mm latus, ad basim bituberculatus, ad apicem incrassatus et rugoso-nervius."

Mindanao, District of Davao, Mount Apo, *Copeland 1424,* October 23, 1904, epiphyte, flowers yellowish-white: Province of Misamis, Mount Malindang, *For. Bur. 4612 Mearns & Hutchinson,* May, 1906. Luzon, Province of Bataan, Mount Mariveles, *Merrill* (*herb. Ames no. 8478*).

E. ventricosa sp. nov.

Pseudobulbi fere cylindracei, infra aliquanto incrassati, circiter 3 cm longi, *vaginis* ovatis equitantibus ad 3 cm longis vestiti. *Folia* 2, lanceolata, oblanceolata, vel elliptico-lanceolata, brevipetiolata, ad 14 cm longa, circiter 1.5 cm lata. *Inflorescentiae* 1 vel 2, 5.5 cm longae, pubescentes; pedunculus plus minus 2 cm longus, pergracilis, *bracteis* 2 vel 3 latis amplectantibus instructus, sparse albido-pubescens. *Flores* circiter 12, in axillis *bractearum* ovatarum, acutarum, cucullatarum, ciliato-marginatarum, ovario aequalium. *Pedicellus* subnullus. *Ovarium* albido-pubescens, circiter 3 mm longum. *Mentum* in sicco oblongum, circiter 4 mm longum. *Sepalum dorsale* obovatum, cucullatum, extus sparse pubescens, 5 mm longum, 2.5–3 mm latum. *Sepala lateralia* extus pubescentia, inflata, triangulari-oblonga, margine anteriore et nervis sigmoideis, 4 mm longa, 6 mm lata. *Petala* obovata-oblonga, acuta vel obtusa, aliquid falcata, plus minus 4 mm longa, 1.5–2 mm lata. *Labellum* 5 mm longum, prope basim ventricosum (pars ventricosa 2 mm longa), limbo flabellato-trilobo, 4 mm lato; *lobi laterales* erecti, triangulari-oblongi, ad apicem

rotundati; *lobus medius* reflexus, late triangulari-semiovatus. *Pes columnae* circiter 4 mm longus, rectus, ferme linearis, apice dilatato cum labello ubi conjugit. *Columna* vix 2 mm alta. (Fig. 16.)

Type specimen collected by *T. E. Borden, For. Bur. 798*, May, 1904, Lamao River, Province of Bataan, Luzon, part in Manila, part in herb. Ames, flowers very delicate, cream-white; same locality, *Whitford 338, 1334*, May, 1904, May, 1905, flowers white, leaves 26 cm long. MINDORO, Mount Halcon (living plant, flowered at North Easton, *herb. Ames 10608*).

Two or three other collections show deviations from the above-described condition. While there is not an absolute separation of characters, of such a nature as to allow of specific distinction, a varietal difference should be pointed out.

Var. **benguetensis** var. nov.

Flores majores, *bracteis* longioribus, *petalis* angustioribus.

LUZON, District of Lepanto, Bagnen, *Merrill 4849* (type), November 4, 1905, terrestrial in mossy forest, flowers white: Province of Benguet, Suyoc to Pauai, *Merrill 4853*, November 7, 1905, epiphytic in mossy forest, flowers white, altitude 1,950 m; Mount Tonglon, *For. Bur. 4986 Curran*, August 8, 1906, flowers white.

Mr. W. S. Lyon, a horticulturist in Manila, has recently brought to light a new species in this section, for whom the following is named:

E. Lyonii sp. nov.

Rhizoma in sicco 5 mm crassum. *Pseudobulbi* 2–5 cm distantes, plus minus 2.5 cm longi, plus minus 1.5 cm in diametro in sicco, ovoidei. *Folia* 2, lanceolata vel oblanceolata, acuminata, ad 24 cm longa, 2.5 cm lata. *Inflorescentia* erecta, ex axilla folii prope apicem pseudobulbi orta, omnino plus quam 10 cm longa; *pedunculus* pubescens, aliquid crassus; *rhachis* angulatus. *Flores* (probabiliter ±15) haud conferti, mediocres, extus pubescentes, sessiles, habete flavidi, limitibus rubidis, labello albo, basi pure flava. *Ovarium* plus minus 5 mm longum, breviter tomentosum, pilis rufescentibus. *Sepalum dorsale* lanceolato-ligulatum, acutum, 1 cm longum, 3.5 mm latum. *Sepala lateralia* triangulari-falcata, acuta, 1 cm longa, ad basim 5 mm lata, *mentum* conicum fere 3 mm longum aliquanto acutum formantia. *Petala* lanceolato-ovata, acuta, ± 1 cm longa, plus minus 4 mm lata, aliquid falcata. *Labellum* ovatum, trilobatum, ± 8 mm longum, plus minus 4 mm latum; *lobi laterales* ad medium labelli, rotundati; *lobus medius* obovato-oblongus, acutus, plus minus 4 mm longus; in disco linea tria elevata, ad basim lobi medii extendentia, duo lateralia furcata. *Columna* crassa, plus minus 2 mm alta. *Pes columnae* latus excavatus. (Fig. 17.)

"Probably terrestrial, odor faint cinnamon, flowers dull-yellow clearly lined with red, lip white, unmarked, with yellow base, sea level, Province of Tarlac, Luzon, September, 1907," Lyon.

E. rugosa Lindley Orch. Pl. (1830) 66; Miq. Fl. Ind. Bat. 3:661; Gard. Chron. N. S. 18 (1882) 500; J. J. Smith Orch. Java 378, Orch. Amboin. 73; Ames Orchidaceae 2 (1908) 193, sub *E. javanica*.

Dendrolirium rugosum Bl. Bijdr. (July, 1825) 345.

Eria stellata Lindley Bot. Reg. (August, 1825) *t. 904*, and Orch. Pl. 67; Paxton's Mag. Bot. 2 (1836) 137, 4 (1838) 234; Hook. Bot. Mag. *t. 3605;*

Miquel Fl. Ind. Bat. 3:661; Reichb. f. in Walp. Ann. 6:269; Naves in Nov. App. Fl. Filip. (1883) 236; Ridley in Trans. Linn. Soc. Bot. II 3 (1893) 366, Journ. Linn. Soc. Bot. 31 (1896) 285, 32 (1896) 304; Kränzlin in Schumann & Lauterbach Fl. Deutsch. Schutzg. Südsee 248.

Octomeria stellata Spreng. Syst. Veg. 4 Cur. Post. (1827) 310.

"*Bulbis* oblongis triquetris apice 1–2-phyllis, *foliis* oblongo-lanceolatis nervosis, *spicis* erectis *sepalisque exterioribus* tenuiter fusco-tomentosis, *bracteis* membranaceis, *labello* intus membranaceo-crispato, limbo lobo medio ovato acuto." Blume *l. c.*

Luzon, Province of Albay, *Loher 6003*, flowering in Manila June 6, 1905: Province of Rizal, *Bur. Sci. 3036 Ramos*, July 31, 1907, flowers reddish-purple with markings of pure yellow.

E. Merrillii Ames in Philip. Journ. Sci. 2 (1907) Bot. 331.

"*Pseudobulbs* about 1 dm long, very stout, compressed, 3 cm or more in diameter, diphyllous (sometimes bearing more than 2 leaves). *Leaves* oblong-lanceolate, about 3 dm long (up to 6 dm), 4–7 cm wide. *Peduncle* comparatively stout, arising from near the summit of a pseudobulb (erect? or drooping?) bearing numerous very large, nearly white, somewhat purple-tinged *flowers* in a dense, elongated raceme. *Raceme* about 3 dm long. *Bracts* triangular-lanceolate, acute, 1.5–2 cm long, about 4 mm wide at base. *Ovary* very strongly winged, distantly resembling an auger on account of the spiral turnings of the wings. *Lateral sepals* 1.5 cm long, linear-falcate, tapering to an acute apex from a 6 mm broad base. *Upper sepal* linear, 1.9 cm long, 3 mm wide, tapering gradually to an obtuse tip. *Petals* similar to the lateral sepals, 1.6 cm long, about 4 mm wide at base. *Labellum* 11–11.5 mm long, 3-lobed; *lateral lobes* comparatively small, curved, about 1 mm long, 1 mm wide, obtuse, 5.5 mm from the base of the labellum; *middle lobe* 7 mm long, 2.5 mm wide, oblong, acute. Through the disc of the labellum extend 5 prominent nerves or carinae."

§ **Aëridostachya** Hook. f. Fl. Brit. Ind. 5 (1890) 786 (§ *Acridostachya* Hook. f., *l. c.*, apparently by adoption of Bentham's typographical error, Journ. Linn. Soc. Bot. 18:303); J. J. Smith Orch. Java 402.

"*Pseudobulb* very short, 1-leafed, sheathed as in *Xiphosium*. *Scape* from the base of the pseudobulb, stout, erect. *Flowers* minute, in dense rusty-tomentose spikes; *sepals* very short; *mentum* long, spur-like." Hooker f. *l. c.*

E. Aëridostachya Reichb. f. ex Lindl., and its allies.

Lindley applied the name *Eria Aëridostachya* Journ. Linn. Soc. Bot. 3 (1859) 48, as of Reichenbach's creation ("Reichb. f. in litt."), to a garden specimen of Loddiges, originally derived from Batavia. The description is short and from the present standpoint inadequate, though in Lindley's time it may have amply specified the plant for which it was drawn. Nine years later (1868) Reichenbach described one of Seemann's Fiji plants (Seem. Fl. Vit. 301) as answering to this name, which he had first given to a Javan plant of Zollinger and had then communicated to Lindley. Reichenbach's description is fuller, yet does not serve

to distinguish between several closely related species which now present themselves in Java and the Philippines. J. J. Smith (Orch. Java 402) therefore discards the species, provisionally, with the remark: "Was *E. aëridostachya* anbelangt, welche auch in diese Section gehört, so is die Bieschreibung so oberflachlich, das sie fast alle Arten der Section passt." He distinguishes three Javan species, one of which he surmises is the same as the original *E. Aëridostachya* of Lindley.

The type of the species, if in existence and well preserved, should identify this species even in default of verbal description. Lindley's Loddiges plant is the type. This specimen is in the Lindley herbarium at Kew and is perfectly serviceable. Through the kindness of the curator I was permitted to boil out a flower and to make camera lucida drawings, which are reproduced herewith. (Fig. 1.) The following notes and measurements may help to improve the definition of the species:

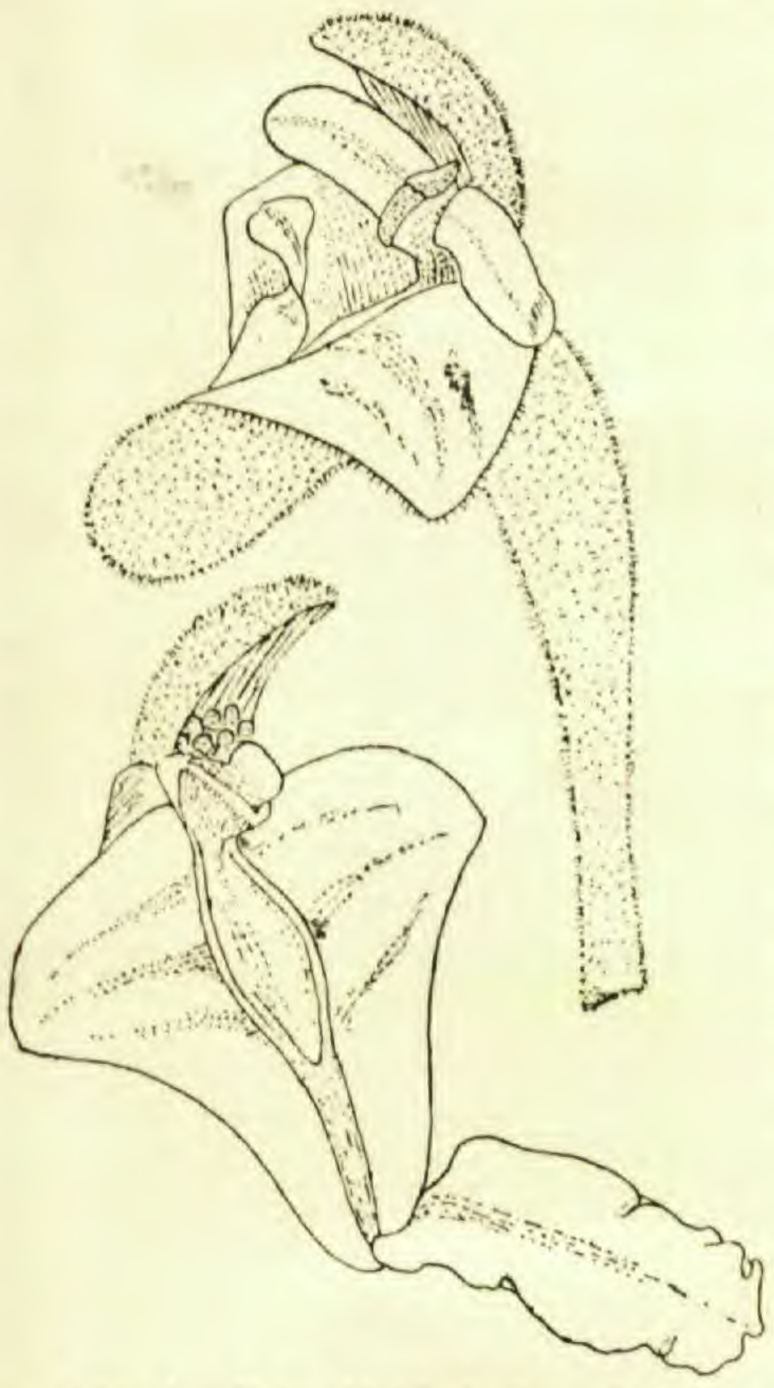

FIG. 1.—*Eria Aëridostachya*, from Lindley's type.

Type in the Lindley herbarium at Kew, marked "Batavia, Loddiges," consisting of a single leaf and a not fully developed inflorescence. A drawing of the lip, evidently from the living flower, by Lindley, is attached to the sheet. Length of oblanceolate *leaf* (not entire) 27 cm, width 2.7 cm. *Inflorescence* with peduncle 26.5 cm long. *Raceme* (not fully expanded) 12 cm long, up to 2.7 cm in diameter. *Peduncle* 3 mm thick. The whole *inflorescence* short-woolly pubescent, or tomentose. *Pedicel and ovary*, from rhachis to base of mentum, 9 mm in fully developed flowers. *Mentum* making a large angle (up to 90°) with ovary, 4 mm long. *Dorsal sepal* concave, ovate, nearly 4 mm long, 2.5 mm broad when spread out. *Lateral sepals* 3 mm long measured perpendicularly from column-foot to blunt apex. *Petals ligulate*, curved, round at apex, 3.5 mm long, 1.25 mm wide. *Lip* oblong when spread, scarcely acute, 5 mm long, 2 mm wide. *Column-foot* 5.5 mm long, nearly straight, lanceolate, the upper half concave, with raised edges which meet below and above run up on sides of column. *Column* scarcely 1 mm high, at right-angles with foot.

Inasmuch as the appellative *Aëridostachya* is attributed by Lindley to Reichenbach, it is of interest to know what this author meant by the designation. In the Gray Herbarium at Cambridge, Massachusetts, there is a Seemann specimen of the number cited in the Flora Vitiensis, and labeled *E. Aëridostachya* in Reichenbach's hand. The flowers are rather old, but the specimen throughout agrees very well with Lindley's: and thus again we escape ambiguity.

There would now seem to be no reason for discarding *E. Aëridostachya*.

The species of this section are often very close together. Indeed, several of the species, though doubtless very distinct in life, are separated by differences of such a nature that the published descriptions suffice to distinguish them, in the dried state, only with difficulty. The description of *E. falcata* J. J. Smith (Orch. Java 404) fits almost perfectly the representations which I have of *E. Aëridostachya*, and Smith is very likely right in thinking that *E. falcata* is the species

which Lindley had. Yet the description of *E. Junghuhnii* J. J. Smith (op. cit. 405) almost equally fits *E. Aëridostachya*, as far as the material of the latter goes. In the Leiden herbarium I was puzzled to find any satisfactory difference between the type of *E. Junghuhnii* and my camera drawings from the type of *E. Aëridostachya*. Reproductions of a flower from the type of the former species show the lip to be of somewhat different proportions from that of the latter species. The photograph of *E. Junghuhnii* shows some slight differences also. There is no reason to doubt that Smith, who has cultivated the three Javan species, is right in his distinctions. I wish to point the truth, that while the closely similar species are probably distinct, descriptions and even drawings are barely if at all sufficient to separate the plants in their dried state. It will be necessary for the successful monographer of the genus to compare type specimens and perhaps living plants.

In characterizing a Philippine species which I regard as distinct from *E. Aëridostachya* and from the Javan species, I encountered the above noted descriptive difficulty. Placed side by side with flowers of *E. Aëridostachya* at Kew, the flowers of this Philippine *Eria* were seen to depart from the type, yet in such manner that specification was difficult. The deviations pertained to pubescence, texture, color of the dried specimen, heaviness of veining and to little differences of proportion throughout. I propose, as a new species

E. Whitfordii sp. nov.

Herba robusta, epiphytica, *E. Aëridostachyae* similis. *Pseudobulbi* usque ad 10 cm longi, omnino tecti *vaginis* magnis laxisque, in sicco divaricatis, imis 2–3 cm longis, supremis usque ad 12 cm longis; *pseudobulbus* cum vaginis in sicco 5–7 cm latus. *Folia* oblanceolata, 37 cm longa, 3–5 cm lata. *Pedunculus* circiter 17 cm longus, 2 mm in diametro, breviter pubescens. *Rhachis* inflorescentiae plus minus 14 cm longus, dense pubescens tomento brunneo perbrevi, etiam, oculo nudo ut videtur, fere pulvereo. *Racemus* dense multiflorus, cylindraceus, arcuatus, vix 2 cm in diametro. *Bracteae* flores subtendentes late ovatae, cucullatae, circiter 1 mm longae. Flores extus dense pubescentes tomento perbrevi, brunneo seu ferrugineo. *Ovarium* cum pedicello comparate crassum, 5–6 mm longum ad basim menti. *Mentum* 3 mm longum, 2.7 mm in diametro, ad apicem rotundatum, cum ovario angulum acutum formans. *Sepalum dorsale* ovato-oblongum, cucullatum, 3-nervium, 4.5 mm longum, 2.6 mm latum. *Sepala lateralia* lata, obtusa, falcata, infra multo producta secundum pedem columnae, valde 3-nervia (vel nervi 5), 11.8 mm in diametro maximo. *Petala ligulata*, curvata, apicibus rotundatis, 3-nervia, 3.8 mm longa, 1.6 mm lata. *Labellum* integrum aliquid incrassatum, explanatum oblongo-ovatum margine crispata, 3–5-nervium, ad basim paulo angustatum, 6 mm longum, usque ad 4 mm latum, infra ad apicem cuspide minuto munitum, margine crispata. *Columna* sine operculo antherae 1.5 mm alta. *Pes columnae* sigmoideus, clavatus, antice sulcatus, 5 mm longus.

Luzon, Province of Bataan, Mount Mariveles, *Whitford 1119* (type), March, 1905, spikes of tan and yellow, *Merrill* (*hb. Ames. no. 7225*).

E. Whitfordii differs from *E. Aëridostachya* in its slenderer raceme, shorter and

browner pubescence on the inflorescence, shorter ovary and pedicel, shorter mentum and narrower angle between mentum and ovary, more fleshy consistence of the flower, heavier veining of the perianth (the veins especially deeply stained in the lateral sepals), somewhat wider petals, and larger lip. Dried, the interior of the sepals and petals appears very dark.

A third specimen from Mount Mariveles (Lamao River, March, 1905, *For. Bur. 2752 Borden*) perhaps belongs to the above species, though the peduncle is very slender, the consistence of the floral parts is much less firm than in typical *E. Whitfordii*, the petals are shorter, the lip much smaller and proportionally broader distally, tapering toward the base, and the column smaller and straighter with the foot. The floral parts are described by the collector as yellow with purple center. It remains to be seen whether this is a distinct species, or whether all the specimens cited (with *Whitford 330*, from the same region, the flowers too old for determination, but the lip apparently acuminate) belong to a single fluctuating species.

In Mindanao, Major E. A. Mearns and Mr. W. I. Hutchinson collected seven specimens of an *Eria* belonging to this section, which I have no hesitation in describing as a new species.

E. Mearnsii sp. nov.

Herba epiphytica, habitu *E. Aëridostachyae,* sed in membris omnibus minor. *Pseudobulbi* usque ad 7 cm longi, vaginis strictis vestiti, infra comparate parvis, supra usque ad 8 cm longis; pseudobulbus cum bracteis in sicco plus minus 2 cm latus. *Folia* 2, oblanceolata, 18–25 cm longa, 2.5–3.5 cm lata. *Inflorescentiae* 2, usque ad 21 cm longae, *pedunculus* ad 13 cm longus. *Pedunculus, rhachis, et flores* dense pubescentes, pilis perbrevibus, fulvis vel brunneo-fulvis. *Racemus* dense multiflorus, 1.6 cm in diametro, in anthesi recurvatus. *Flores* reclinati. *Pedicellus ovariumque* graciles, 4–5 mm longi. *Mentum* angulum acutum cum ovario formans, aliquid scrotiforme, 3 mm longum. *Sepalum dorsale* cucullatum ovatum, obtusum, 3-nervium, 3.7 mm longum, 2 mm latum. *Sepala lateralia* ut in specie praecedente, sed minoria, 10 mm in diametro maximo. *Petala* valde curvata, ad basim aliquid latiora (et colorata?), 3-nervia, 3 mm longa, prope basim circiter 1.6 mm lata, 4.5 mm longa. *Labellum* 3-lobatum, cuneato-obovatum, vel obovatum, 4.5 mm longum, circiter 3 mm latum, basi excavata; *lobi laterales* haud conspicui, dentiformes, obtusi; *lobus medius* magnus, late ovatus sive semiorbicularis, margine crispato, apice acuto. *Pes columnae* sigmoideus, apud columnam latissimus, ad apicem fastigatus, antice sulcatus, 3 mm longus. *Columna* cum ovario continua (i. e. erecta), parva et humilis, vix 1 mm alta.

Mindanao, Province of Misamis, Mount Malindang, *For. Bur. 4729* (type), *4604 Mearns & Hutchinson*, May 26, 1906, altitude 1,700 m, flowers reddish.

§ **DENDROLIRIUM** Lindley in Journ. Linn. Soc. Bot. 3 (1859) 48; Bentham l. c. 18 (1881) 303; Bentham & Hook. f. Gen. Pl. 3:510; Hooker f. Fl. Brit. Ind. 5:786; Pfitzer in Engl. & Prantl. Nat. Pflanzenfam. 2^{6}: 176; J. J. Smith Orch. Java 380.

"If we collect into one group all the large-flowered woolly species with pseudobulbs only, an assemblage will be formed both natural and obvious,

to which Blume's happy name of *Dendrolirium* may be applied. Some terete-leaved plants can hardly indeed be said to form pseudobulbs; but their leaves fall eventually from the summit of very short stems altogether analogous to pseudobulbs, although unlike in form. Two divisions are affected by taking into account the form of the leaves." Lindley *l. c.*

E. ornata Lindley Orch. Pl. (1830) 66; de Vriese Ill. Orch. *t. 13;* Reichb. f. in Bonpl. **5** (1857) 54; Miquel Fl. Ind. Bat. **3**:660; Vidal Phan. Cuming. Philip. (1885) 78, 149, Rev. Pl. Vasc. Filip. (1886) 268; Ridley in Journ. Linn. Soc. Bot. **32** (1896) 302; Schlechter in Perk. Frag. Fl. Philip. 43; J. J. Smith Orch. Java 380; Ames Orchidaceae **1** (1905) 94, **2** (1908) 195.

Dendrolirium ornatum Blume Bijdr. (1825) 345.

Eria armeniaca Lindley Bot. Reg. (1841) Misc. 38, and *t. 42.*

"*Bulbis* ovalibus compressiusculis sub-3 phyllis, *foliis* oblongo-lanceolatis rigidis nervosis, *spica* radicali vaginata *sepalisque* exterioribus fusco-tomentosis, *bracteis* coriaceis margine recurvis, *labello* intus crispato-cristato, limbi *lobo medio* acuminato. (Bracteae rubrae, demum aurantiacae. Species pulcherrima.)." Blume *l. c.*

Having seen *E. armeniaca* Lindl. at Kew and *E. ornata* Lindl. at Leiden, that is, *Dendrolirium ornatum* Bl., the type, with both of which the Philippine material has been compared, I agree with J. J. Smith in combining them under the older name. If there is any difference between the Javan and the Philippine plants, this difference is lost in the dried state, and is too small to be considered specific.

LUZON, Province of Rizal, Tanay, *Merrill 2361,* May 20, 1903: Province of Benguet, Sablan, *Elmer 6236,* April 11, 1904: Province of Zambales, *For. Bur. 7390 Curran,* May 13, 1907, epiphytic, flowers dull-purple. NEGROS, *For. Bur. 11204 Everett,* April, 1908.

§ **MYCARANTHES** Reichb. f. in Bonplandia **5** (1857) 55; Blume ex J. J. Smith Orch. Java 391. § *Eriura* Lindley in Journ. Linn. Soc. Bot. **3** (1859) 55; Bentham *l. c.* **18** (1881) 303; Bentham & Hook. f. Gen. Pl. **3**: 510; Hooker f. Fl. Brit. Ind. **5**: 785; Pfitzer in Engl. & Prantl Nat. Pflanzenfam. **2**^{6}: 175. Not § *Mycaranthes* Lindley in Journ. Linn. Soc. Bot. **3** (1859) 51, Hook. f. *l. c.*, Pfitzer *l. c.*, not § *Mycaranthus* Blume ex Benth. in Journ. Linn. Soc. Bot. **18** (1881) 303; Benth. & Hook. f. Gen. Pl. **3**: 510.

Blume merely suggested the addition of his genus to *Eria* (Mus. Bot. Lugd.-Bat. **2**: 182); but in the absence of definite decision his "*si levior videatur vegetationis character,*" can hardly be regarded as effecting the union. On the other hand Reichenbach uses the name definitely as a sectional designation and his transference of all Blume's *Mycaranthes* species severally, with proper credit, to *Eria* under this section, is satisfactory reference to the origin and sufficient indication of the limits of the section. Lindley mistook the original genus, and applied the name to Erias of quite another kind, making a new section (§ *Eriura*) for species properly belonging to Reichenbach's section *Mycaranthes;* in which error he has been followed by several authors. The small group of species with woolly flowers in secund spikes (*Eria stricta* Lindl., etc.) characterized by Lindley in Journ. Linn. Soc. Bot. **3**: 51, and further defined by Hooker f. in Fl. Brit. Ind. **5**: 785, by both authors under the appellation § *Mycaranthes,* is therefore without a name. I propose the designation § **Secundae,** nom. nov.

The section *Mycaranthes* embraces thus far in the Philippines five species. *E. gigantea* Ames is much like *E. bidens* Ridley, E. *iridifolia* Hook. f., and *E.*

tricuspidata Rolfe. Flowers placed beside those of these three species at Kew, by myself, were seen to be very similar; though the lip of *E. gigantea* does not agree at all well with Hooker's figure for *E. iridifolia* (Ic. Pl. *t. 2067*), nor with Ridley's published description of *E. bidens* (Journ. Linn. Soc. Bot. **32:** 289). Mr. Rolfe's *E. tricuspidata* is a much weaker plant than the others. *E. gigantea* is at times extremely robust. According to the Kew and our own specimens, which indeed are typical, the four species form a very close group within this section.

E. gigantea Ames Orchidaceae **2** (1908) 192.

"*Caulis* circa 6 dm altus, ad basim circa 3 cm crassitudine. *Folia* disticha, approximata, oblonga vel lineari-oblonga, acuta, circa 2 dm longa, circa 2 cm lata. *Bracteae* pedunculos 3–4, fasciculatos subtendentes, 5 cm longae, conduplicatae. *Pedunculus rhachisque* sericeo-pubescens. *Racemus* densiflorus, circa 15 cm longus, ad 2.5 cm in diametro. *Bracteae* 3 mm longae, pallide flavae, crassae, rigidae, ovatae, obtusae, pedicellis breviores. *Flores* flavi, caduci, sparsim maculati purpura rubida opacaque, emittentes odorem olei Ricini. *Pedicellus et ovarium* pubescentia. *Sepala* patentia, externe pubescentia. *Sepala lateralia* 6 mm longa, ovato-lanceolata, obtusa vel subacuta. *Sepalum dorsale* 5 mm longum, oblongum, subacutum. *Petala* 4 mm longa, lineari-oblonga, obtusa. *Labellum* 6 mm longum, 3-lobatum; *lobi laterales* 2 mm lati, ovato-oblongi, falcati, obtusi; *lobus medius* 2 mm longus, suborbicularis, deflexus, margine irregulari dentato; ad basim labelli 3 *tubercula,* quorum medium longius; prope apicem labelli *tuberculum* permagnum, subpyramidale, post quod *papilla* multo minor, vel *callus;* utroque in disco callus carinatus lobis lateralibus parallelus; tubercula basis et apicis et linea media disci copiose cerosa."

Luzon, Province of Bataan, Mount Mariveles, *Merrill 4110,* May 25, 1905, altitude 600 m, flowers yellow with small dark-purple dots: Province of Rizal, Bosoboso, *Bur. Sci. 3430 Ramos,* May, 1907. Mindanao, Province of Misamis, Mount Malindang, *For. Bur. 4606 Mearns & Hutchinson,* June 4, 1906, flowers yellow, altitude 1,200 m: Lake Lanao, Camp Keithley, *Mrs. Clemens 437,* March, 1906, like corn-stalk in height.

A second Philippine species agrees well with the representations and descriptions of *E. major* Ridley (*E. Kingii* Hook. f. Ic. Pl. *t. 2066*), although my material has not been compared directly with the type.

E. major Ridley ex Stapf in Trans. Linn. Soc. Bot. II 4 (1894) 237, in synonymy.

E. Scortechinii Stapf *l. c.,* not Hook. f.

E. Kingii Hook. f. Fl. Brit. Ind. **5** (1890) 790; Ic. Pl. *t. 2066,* not *E. Kingii* F. Muell.

"*Stem* stout, leaves 4–7 in. linear-lanceolate unilaterally acuminate much shorter than the 1–3 *scapes, bracts* minute reflexed, *pedicels* slender, *lip* suborbicular, *side lobes* falcately oblong with a tooth at the sinus, *mid-lobe* subreniform, axis with a thick woolly ridge leading from 1 or 2 small papillae at the base to a woolly knob on the midlobe.

"*Stems* 2–3 ft., as thick as a swan-quill. *Leaves* coriaceous, nerved. *Racemes* 8–12 in.; *bracts* 1½ in.; *flowers* blue within; *mentum* cylindric; *petals* oblanceolate, 3-nerved. *Capsule* ¾ in., linear." Hooker f. Fl. Brit. Ind. *l. c.*

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4595 Mearns & Hutchinson*, May, 1906, altitude 1,750 m, flowers with a purplish tinge.

The three remaining species appear to be undescribed, and I will characterize them here. Between two of them the floral differences in the dried state are not great, but the vegetative differences are more pronounced. In both the floral conformation is very like that of *E. major* Ridl. The third is easily separated from any of the heretofore described species.

E. longibracteata sp. nov.

Caules foliosi, graciles, vaginis foliorum tecti, in sicco 4 mm diametro, ad 45 cm longi; internodii circiter 4 cm longi. *Folia* anguste lanceolata vel etiam graminea, longe attenuata, acutissima; laminae disarticulatae nunc 14 cm longae, 1 cm latae, nunc 21 cm longae, 6 mm latae, vel saepius breviores; vaginae cylindraceae, circiter 5 cm longae. *Racemi* 2–4, ad summum caulem orti, pedunculati; *inflorescentia* omnis ad 23 cm longa; *pedunculus* ad 6–7 cm longus, lanugine alba, vix densa, bracteas conspicuas (interdum foliaceas) lanceolatas vel lineatas 1.5–6 cm longas et 4 mm latas gerens; *rhachis* lanuginosus; *bracteae* flores subtendentes lanceolatae, acuminatae, acutissimae, 4–20 mm longae. *Pedicellus* cum ovario 5 mm longus, vel longior, lanuginosus, ovario celeriter crescente, post anthesim longitudinem 28 mm attingente. *Flores* extus lanugine albida vestiti. *Sepala* 3.6 mm longa; *dorsale* cymbiformi-ovatum, explanatum vix 2 mm latum; *lateralia* triangularia, aliquid falcata, acuta, extus apicem versus carinata, circiter 3 mm lata ad basim. *Petala* fere elliptica, aliquid asymmetrica, ad apicem rotundata, 3–3.5 mm longa, 1.5–1.9 mm lata. *Labellum* 3–4 mm longum, 3–3.5 mm latum, trilobatum, obovatum, basi breviter unguiculato, aliquid cuneato; *lobi laterales* ferme semiovati, interdum apicibus recurvatis; *lobus medius* bilobulatus, 0.8 mm longus, 2 mm latus, ad apicem dente marginale obtuso; ad basim labelli tuberculum bifurcatum, erectum, farinosum, atque tubercula duo minuta; in disco utrinque callus carinatus, dentiformis, a sinubus lateralibus remotus; e medio lobi terminalis tuberculum permagnum, erectum, conicum, farinosum. *Pes columnae* angulum rectum cum ovario formans, 2 mm longus. *Columna* brevissima. (Fig. 19.)

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4728 Mearns & Hutchinson*, May 25, 1906, altitude 1,700 m, flowers purplish.

E. anceps sp. nov.

Caules ad 30 cm alti; internodia ad 4–5 cm longa. *Folia* lanceolata vel ligulato-lanceolata, lamina ad 20 cm longa et 3 cm lata, acuta, vagina ad 5 cm longa, aliquid ut videtur complanata, tergo subcarinato. *Racemi* 2 vel 3, sparse lanuginosi, ad 17 cm longi, pedunculo circiter 3 cm longo.

Bracteae lanceolatae, acuminatissimae, retroflexae, 2–3 mm longae. *Pedicellus* cum ovario 7–9 mm longus. *Ovarium* lanugine brevi densa albida vestitum. *Sepala* extus sparse pubescentia; dorsale cymbiformi-ovatum vel -oblongum, 3.5 mm longum, explanatum 2.5 mm latum; *lateralia* late ovata, asymmetrica, obtusa, 4–5 mm longa, 4 mm lata ad basim. *Petala* obtusa, obovato-spathulata, interdum obovata, 3.5–4 mm longa, 1.5–1.8 mm lata. *Labellum* perlate obovatum, trilobatum, vix unguiculatum plus minus 4 mm longum, 5 mm latum; *lobi laterales* oblongi, apicibus rotundatis; *lobus medius* subquadratus vel reniformis, margine crenulato; tubercula (calli) 7, 3 ad basim labelli (quorum 2 lateralia minuta), unum lineare prope sinum utrimque, 2 in lobo medio, quorum maximum a centro ortum subulatum vel clavatum, fere 2 mm altum, copiose farinosum. *Pes columnae* 3 mm longus, angulum cum ovario obliquum formans. *Columna* subnulla. (Fig. 18.)

PALAWAN, Mount Victoria, *Bur. Sci. 636 Foxworthy*, March–April, 1906, altitude 250 m, epiphytic, flowers yellow (type, part in herb. Manila, part in herb. Ames). *Whitford 1601* (flowers white) from the Gimagaan River, and *For. Bur. 7275 Everett*, Occidental Negros (flowers yellow), are very similar to *E. anceps* and may be the same, but the material is too scanty.

E. Clemensiae sp. nov.

Caules foliosi ad 45 cm alti, validi, internodiis ad 5 cm longis. *Vaginae foliorum* cylindraceae, ad 5 cm longae, circiter 8 mm in diametro; *laminae* ligulato-lanceolatae, acuminatae, acutae, ad 22 cm longae, 1.8–4 cm latae. *Racemi* 3 vel 4; pedunculi plus minus 15 cm longi, sparse albido-lanuginosi, *bracteis* distantibus, ovatis, acutis, subglabris; *racemi* ad 37 cm longi, *rhachidi* pubescente, *floribus* reflexis, *bracteis* ovatis vel ovato-lanceolatis, acuminatis, 3–5 mm longis. *Ovarium* lanugine albida dense vestitum. *Sepala* extus sparse stellato-pubescentia; *dorsale* cucullatum, oblongum, 4–5 mm longum, circiter 2 mm latum; *lateralia* oblonga, falcata, obtusa, obliqua, ab extremitate pedis columnae ad apicem sepali 6–7 mm longa, circiter 5 mm lata, secundum columnae pedem 2.5–3 mm longum. *Mentum* comparate angustum, conicum, cum ovario angulum valde acutum formans. *Petala* lineari-oblanceolata, acuta, 5 mm longa, 1–1.5 mm lata. *Labellum* trilobum; *lobi laterales* a basi labelli divaricati ligulati, ad apicem rotundati, 5 mm longi, ad basim 2 mm lati; *lobus medius* unguiculatus, flabellatus vel obscure 2-lobulatus, margine anteriore irregulariter dentato, 2 mm longus, 4 mm latus; calli 4, unus ad basim labelli farinosus, duo subulati prope sinus loborum, unus magnus rostriformis copiose farinosus in lobo medio, limbum lobi medii excedens, carinae crassae farinosae per medium labellum currenti-conjunctus. *Pes columnae* 3.5 mm longus. (Fig. 20.)

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 602*, June, 1906 (part in herb. Manila, part in herb. Ames).

§ **CYLINDROLOBUS** Blume Mus. Bot. Lugd.-Bat. **2** (1856) 182; Lindley in Journ. Linn. Soc. Bot. **3** (1859) 58; Bentham *l. c.* **18** (1881) 303; Bentham & Hook. f. Gen. Pl. **3**:510; Pfitzer in Engl. & Prantl Nat. Pflanzenfam. 2^6:175; J. J. Smith Orch. Java 389.

"I. Subgen. *Cylindrolobus. Labellum* gynostemii pedi ima in cristulam v. tuberculum protuberanti elastice affixum, limbo subfornicato. *Gynostemium* androclinio obtuse-biauriculato. *Pollinia* inaequalia.—*Herbae* caulescentes, glabrae; caulibus in caudice superficiali subfasciculatis, simplicibus; *foliis* sessilibus, distichis, coriaceis; *racemis* oppositifoliis lateralibusve, solitariis, paucifloris; *capsulis* elongatis, siliquaeformibus." Blume, *l. c.*

This section, first described as a genus, was by its author subsequently joined to *Eria* as a subgenus. Since by this categorical term Blume meant to designate one of several coördinate divisions of the genus, and meant precisely what present writers intend by the word *section*, the section *Cylindrolobus* is properly ascribed to Blume, neither the group of plants designated nor the relative categorical rank of the name being thereby altered. This is a matter of interpretation rather than of technicality.

E. fastigatifolia Ames Orchidaceae **2** (1908) 191.

"Habitu *E. brachystacheae* Reichb. f. haud dissimilis. *Caulis* ± 5 dm longus, 0.5–1 cm crassus, foliosus. *Folia* acuta, acuminata, sublinearia vel a basi lato, vaginante, persistente, in sicco amplo ad apicem paulatim fastigata, 10–15 cm longa, ad basim ± 6 mm lata. *Anthemia* oppositifolia cum pedunculo 2–3 cm longa, circa 10–flora. *Bracteae inflorescentiae* oblongae, circa 6 mm latae. *Pedicellus* 2 mm longus, ovario brevior. *Sepala lateralia* oblonga, subacuta vel obtusa, subfalcata, 5.5 mm longa, 3 mm lata, 5-nervia. *Sepalum dorsale* simile, 5 mm longum, obtusum. *Petala* lineari-spathulata, 4 mm longa, supra medium 1.25 mm lata. *Labellum* 4.5–5 mm longum, bilobatum ad apicem, ad basim cuneatum, prope apicem nervis incrassatis."

E. brachystachya Reichb. f. in Bonplandia **3** (1855) 223; Ames Orchidaceae **2** (1908) 188.

"*Caule* ac *foliis* prope *Eriae paniculatae* Lindl., spicis oppositifoliis plurimis abbreviatis, *bracteis* lanceolatis acutis ovaria glabra aequantibus superantibusve, *labello* cuneato, flabellato, antice trilobo, *lobo medio* semiovato acutiusculo, *lobis lateralibus* obtusangulis, carinulis geminis curvato divergentibus a basi in medium, carina per discum lobi medii tomentosi.—*Caulis* adest spithamaeus. *Folia* linearilanceolata acuminata, subcoriacea apice inaequaliter bilobula, quatuor sive quinque pollices longa, quatuor lineae lata. *Pedunculi* semipollicares tenues, quadri-quinqueflori. *Bracteae* pergameneae. *Flores* illis *Eriae profusae* duplo majores, glabrae. *Mentum* modicum obtusum. *Sepala* ovato lanceolata. *Tepala* duplo angustiora. Labellum sepalis brevius. *Gynostemium* brevissimum apice antice trilobum. 2063 Cuming. Phil." Reichb. f., *l. c.*

CAMIGUIN, Babuyanes Islands, *Bur. Sci. 4136 Fénix*, July 16, 1907, epiphyte, summit of the highest mountain. MINDANAO, *Lyon "H"*, December, 1907.

§ **TRICHOTOSIA** Blume Mus. Bot. Lugd.-Bat. **2** (1856) 183; Reichb. f. in Bonplandia **5** (1857) 55; Lindley in Journ. Linn. Soc. Bot. **3** (1859) 56; Benth. *l. c.* **18** (1881) 303; Benth. & Hook. f. Gen. Pl. **3**:510; Pfitzer in Engl. & Prantl Nat. Pflanzenfam. **2**^{6}: 175; J. J. Smith Orch. Java 383.

"II. Subgen. *Trichotosia. Labellum* subunguiculatum, limbo erecto v. patente. *Gynostemium* obtusum. *Pollinia* aequalia v. inaequalia.—*Herbae* caulescentes, pilosiusculae; *caulibus* simplicibus rarius ramosis, plerumque fasciculatis; *foliis* sessilibus rarissime brevissime petiolatis, distichis, carnosis s. coriaceis, apice saepe inaequalibus; *spicis* oppositifoliis, solitariis, pauci- v. multifloris; bracteatis." Blume, *l. c.*

The commonest representative of this well-marked section in the Philippines seems to be *E. vulpina* Reichb. f. This and *E. fusca* Bl. were the only Trichotosias credibly reported from the Islands before the American occupation. Recent collections have added four species before unknown, two of them herein described for the first time. In proposing fresh additions to the section, it must be confessed that the elimination of such older species as have never been pictured, or of which some representation other than verbal has not been available, has often been difficult. The descriptions of the earlier botanists are now inadequate; moreover, even the very detailed diagnoses of present writers have sometimes proved ambiguous, owing no doubt to the comparative characterlessness of the species of this section. It is imperative that authors of new species of § *Trichotosia* publish figures exhibiting distinctive characters.

E. vulpina Reichb. f. in Bonplandia **3** (1855) 222; Miq. Fl. Ind. Bat. **3**:660; Lindley Bot. Reg. (1845) *t. 2*, in part; Naves Nov. App. 236; Vidal Phan. Cuming. Philip. (1885) 149, Rev. Pl. Vasc. Filip. (1886) 268; Ames in Philip. Journ. Sci. **2** (1907) Bot. 332, Orchidaceae **2** (1908) 198.

"Aff. *E. vestitae* Lindl., *labelli* ungue lineari lamina longiori, lamina obtuse quadrata basi utrimque unidentata, tuberculo in basi ante unguem. *Caulis* calamum anatinum crassus. *Vaginae* uti folia. *Bracteae, pedunculus, ovarium, sepala* rufo pilosa. *Folium* oblongum acutatum nervosum quinque pollices longum, duos latum. *Pedunculus* ultra bipollicaris. *Bracteae* oblongae acutiusculae (cymbiflores?), ovariis tertia breviores. *Sepala* in saccum obtusum elongata. *Tepala* lineari falcata. *Labelli* unguis supra apicem pedis gynostemii brevissimi adnatus. 2071. Cuming. Phil." Reichb. f., *l. c.*

Luzon, Province of Rizal, Mount Bantay, *Loher 6014:* Province of Pampanga, Mount Arayat, *Merrill 3823*, May, 1904: Province of Tayabas, Mount Banajao, *Elmer 7394*, May, 1906. Negros, Canlaon Volcano, *Bur. Sci. 1161 Banks*, June, 1906. Mindanao, District of Zamboanga, San Ramon, *Copeland 1570*, February, 1905.

? **E. fusca** Blume Mus. Bot. Lugd.-Bat. **2** (1856) 183; Miq. Fl. Ind. Bat. **3**:658; Vid. Phan. Cuming. Philip. (1885) 149, Rev. Pl. Vasc. Filip. (1886) 268; Rolfe in Journ. Bot. **23** (1885) 215; J. J. Smith Orch. Java 388.

"*Caulibus* fuscescenti-tomentosis; *foliis* carnosis lanceolatis acuminatis supra glabriusculis subtus tomentosis; *spicis* brevibus densifloris; *labello* spathulato intus lineis tribus, lateralibus subnudis, intermedia papillosa apice interrupta, limbi breviter trilobi lobo medio erecto emarginato undulato." Blume, *l. c.*

NEGROS, *For. Bur. 5582 Everett*, epiphytic, flowers reddish, altitude 50 m, October 31, 1906; Gimagaan River, *Copeland 138*, January 5, 1904, on fallen branches in forests.

E. fusca may include the following species, which nevertheless for the present may be left standing. The inflorescence here is more open, the bracts being relatively slenderer and further apart. In *E. binabayensis* the bracts on the type are very round and crowded, and are not so hairy.

E. binabayensis Ames in Philip. Journ. Sci. 2 (1907) Bot. 329.

"Allied to *E. oligantha* Hook. f. *Plants* rather stout, 4–5 dm tall. *Stems* about 5 mm in diameter. *Leaves* oblong-lanceolate, tapering gradually toward the point, about 1 dm long, 1–2 cm wide, rigid, coriaceous, pubescent. *Inflorescence* leaf-opposed, clothed with dense, cinnabar-red tomentum. *Bracts* about 1 cm long. *Raceme* short, 3 cm long, probably becoming longer as the flowers develop. *Lateral* sepals triangular-lanceolate, densely tomentose externally, 1 cm long, about 8 mm wide at base. *Upper sepal* oblong, narrower than the laterals. *Petals* linear-spathulate, subobtuse, 7–8.5 mm long, 2 mm wide above the middle. *Labellum* 1 cm long, narrowly cuneate at base, then gradually dilated to within 2 mm of the tip, where it is constricted and about 4 mm wide; above the constriction it is again dilated into a transversely oblong, 6–7 mm wide plate; disc bicarinate."

E. odorifera sp. nov.

Herba epiphytica, aspectu *E. annulatae* Bl., atque, ut videtur, affinis *E. phaeotrichae* Schlechter. *Caulis* plus quam 25 cm longus, aliquid gracilis, internodiis 2.5–3 cm longis, circiter 4 mm diametro. *Foliorum vaginae* artae, cylindraceae, supra paulo dilatatae, internodiis aequilongae, hirsutae, pilis sparsis rufis; *laminae* lanceolatae (interdum oblanceolatae), vel ligulato-lanceolatae, longe acuminatae, acutae, sparse hirsutae pilis rufis vel brunneis, ad 14 cm longae et 1.5 cm latae. *Inflorescentiae* breves, pauciflorae, pilis xanthieis vestitae, circiter 2 cm longae, *bracteis* plus minus 6, suborbicularibus, acuminatis, circiter 8 mm longis. *Sepalum dorsale* hirsutum, oblongum, acutum, extus apud apicem carinatum, 8 mm longum, 3 mm latum. *Sepala lateralia* ovario parallela, ferme oblonga, paulo falcata, extus hirsuta et ad apicem carinata, acuta, mentum ovario aequale oblongum plus minus 5 mm longum formantia, ± 12 mm longa ab apice menti ad apicem sepali, limbo libero 4 mm lato. *Petala* linearia, paulo spathulata, obtusa, aliquid falcata, sepalo dorsali ferme aequilonga, 1.5–2 mm lata. *Labellum* extus intusque pubescens, unguiculato-cuneatum, prope apicem 3-lobatum; *lobi laterales* recti, parvi, oblongi, rotundati; *lobus medius* 2-lobulatus, lobulis ovatis seu orbicularibus; sinus inter lobos laterales et lobum medium inclusi triangulares; labellum totum 12 mm longum (10 mm ad apices loborum lateralium), 5 mm latum. *Columna* cum operculo et pede ± 1 cm longa." (Fig. 24.)

MINDANAO, District of Davao, trail to Mount Apo, altitude 1,500 m, *Copeland 1182*, April 24, 1904, an epiphyte with peculiar odor.

E. halconensis Ames in Philip. Journ. Sci. 2 (1907) Bot. 330; Orchidaceae 3 (1908) 85, *t. 56.*

"*Plant* comparatively slender, about 5 dm tall. *Stems* about 7 mm in diameter near the base, tapering gradually upwards. *Leaves* linear-lanceolate, acuminate, acute, pubescent, about 1 dm long, 7–11 mm wide. *Racemes* leaf-opposed, shorter than the leaves, about 5 cm long, somewhat flexuose, densely covered with reddish yellow hairs. *Bracts* broadly ovate or suborbicular, 4–6 mm long, hairy, abruptly acuminate. *Lateral sepals* triangular, externally hairy, subacute, 7 mm long, about 4 mm wide at base. *Upper sepal* oblong, externally hairy. *Petals* linear, subspathulate, tapering to a subacute or subobtuse apex, 6 mm long, 1.5 mm wide. *Labellum* 7 mm long, linear-cuneate at the base, dilated above, then constricted within 2 mm of the tip, 3-lobed; *lateral lobes* minute, obtuse, formed by the constriction; *middle lobe* subquadrate, apiculate, 3–4 mm wide; disc with a prominent mid-nerve. *Mentum* about 3 mm long." Ames in Philip. Journ. Sci. Bot. *l. c.*

Eria Ramosii sp. nov.

Plantula habitu *E. microphyllae* Bl., dense hirsuta, pilis flavis. *Sympodium* longe repens. *Membra florigera* sympodii ad 5 cm alta, erecta (?). *Caulis* pergracilis, in sicco circiter 0.7 mm in diametro, internodiis ad 7 mm longis. *Bases* persistentes *foliorum* aliquid infundibuliformes internodiis aequilongi, vel saepe longiores, in sicco 1–2 mm diametro; *laminae* ellipticae, oblongae, vel late lanceolatae, acuminatae, circiter 8 mm longae, circiter 3 mm latae. *Flos* solitarius, prope apicem caulis ortus, hirsutus. *Sepalum dorsale* oblongum, acuminatum, plus minus 5 mm longum, plus minus 2 mm latum. *Sepala lateralia* triangula, acuta, circiter 7 mm longa, ad basim circiter 6 mm lata. *Petala* extus pilosa, oblonga, acuminata, acuta, 4–5 mm longa, vix 2 mm lata. *Labellum* integrum, ovatum, extus pilosum, 6 mm longum, 3.5 mm latum, tergo aliquid carinato, carina in apiculum producta. *Columna* (sine operculo), circiter 2 mm alta, crassa, pilosa. *Pollinia* 4, rotundata, subangulata. (Fig. 25.)

Luzon, Province of Rizal, *Bur. Sci. 1775 Ramos,* January, 1907, epiphyte, flowers purplish.

This is a curious little species on the borders of the section, named for the assiduous collector, Maximo Ramos.

The following species can not be legitimately assigned to an established section. In habit it faintly suggests § *Mycaranthes,* but the flower is quite different from that of this section.

E. cymbiformis J. J. Smith Rec. Trav. Bot. Neerl. 1 (1904) 152; Ames in Philip. Journ. Sci. 2 (1907) Bot. 330.

"*Pseudobulbi* breves, circ. 4foliati. *Folia* elongata, linearia, inaequaliter acuta, basi conduplicata, nervis 7 subtus prominentibus, circ. 54 cm longa, 2.20 cm lata; vaginae erectae, conduplicatae, equitantes, nitidae, circ. 11 cm longae. *Inflorescentiae* vaginas ad basim perforantes, foliis breviores, multiflorae, paulum lanuginosae, basi vaginis paucis, circ. 30

cm longae. *Pedunculus* circ. 18 cm longus, bracteis paucis adpressis. *Bracteae* reflexae, lineari-lanceolatae, acutae, circ. 0.40 cm longae. *Flores* patentes, circ. 0.80 cm longi. *Sepalum dorsale* oblongum, obtusum, valde concavum, 5nervium, circ. 0.45 cm longum, 0.25 cm latum, extus disperse pilosum. *Sepala lateralia* ad pedem gynostemii decurrentia, mentum magnum, latum, saccatum, obtusum formantia, late oblique ovato-?angularia, obtusa, 5 nervia, circ. 0.40 cm longa, 0.50 cm lata, extus disperse pilosa. *Petala* oblonga, obtusa, 3nervia, circ. 0.46 cm longa, 0.23 cm lata. *Labellum* erectum, concavo-cymbiforme, basi fere saccatum, apice breviter fere aequaliter 3lobatum, intus costis 3 alaeformibus, media duplici apicem versus evanescenti, lateralibus ad basim lobi medii in lobulum brevem, obtusum, liberum terminantibus, expansum fere quadrangulum, circ. 0.47 cm longum, 0.425 cm latum; *lobi laterales* anguli, obtusi, convexi, vix 1.10 cm longi; *lobus medius* paulo brevior, late 3angulus, obtusus, concavus, marginibus reflexis. *Gynostemium* breve. *Stigma* magnum, profundum, rotundum. *Pes gynostemii* cum ovario angulum acutum, fere rectum formans, rectum, circ. 0.30 cm longum. *Ovarium* pedicellatum circ. 0.60 cm longum." Smith, *l. c.*

LUZON, Province of Bataan, Mount Mariveles, *Merrill 3737*, January 1, 1904. MINDORO, Mount Halcon, *Merrill 5847*, November 26, 1906, epiphytic in ravine forest, altitude 1,200 m.

SYNOPSIS OF SPECIES.

In a large genus the forming of distinct sections is often difficult. Yet with a local treatment, the number of species being limited and the confusing species absent, the matter is arranged much more readily. This is but saying that the rule for comprehensive treatises may be different from the rule for provincial floras. It is permitted to draw lines rather more sharply in the latter than in the former. And in fact it is necessary, if one is to be guided by practical rather than theoretical considerations, to draw them somewhat differently in the local case. With the definitions of sections in the present conspectus I have had regard to the Philippine species alone, feeling free to modify, for the convenience of the student of the Philippine flora in especial, the form given the groups by their authors.

As to the arrangement of the sections, it is obvious that no linear arrangement will represent the natural affinities. *Hymeneria* (in a restricted sense) seems to me to be the most generalized, or central form, introduced perhaps by *Urostachya*—with which it merges—and giving off directly or indirectly *Aëridostachya* and *Dendrolirium*. *Mycaranthes, Cylindrolobus,* and *Trichotosia* are evidently allied, but the exact connection with the rest of the genus is not clear.

Measurements in the following descriptions are taken from dried specimens, and when single measurements are given they are the maxima rather than the averages. Lengths of leaves are taken from the disarticulation and do not include sheathing bases. Length of racemes are exclusive of the peduncle. The height

of the column is taken with the operculum removed. Drawings are invariably from the camera lucida.

§ **UROSTACHYS** Lindley in Journ. Linn. Soc. Bot. **3** (1859) 60.

Stems long and cylindric, not bulbous, though sometimes more or less thickened at base or summit, the sympodium sometimes rhizomatose, clothed with several or numerous papery or scarious and sometimes evanescent sheaths below the leaves; leaves near the summit, glabrous, usually about 6 or 7; racemes several, long, many-flowered; flowers and rachis often glabrous, never extensively woolly-pubescent; labellum usually entire.

A. *Sympodium widely creeping, new shoots arising high on the shoots next preceding, near the leafy crown (at least not near the foot). Cauline sheaths conspicuous, spreading and papery. Leaf-blades tapering evenly from about the middle toward both ends. Lip entire.*

1. **E. polyura** Lindley Bot. Reg. (1841) Misc. 55; supra 203.

FIG. 2.—*Eria polyura*, from Lindley's type.

Stems stout, 1 cm and upward in diameter. Members of the sympodium up to 29 cm long, sometimes clavate by thickening toward the apex; *new growth arising 15–18 cm below the end of the old. Leaves 18 cm long, 3.5 cm wide.* Inflorescences 10–25 cm long, pubescent the scattered tomentum whitish. Floral bracts reflexed, ovate, 4 mm long. Ovary 2–3 mm long. Perianth 5 mm long. Dorsal sepal and petals ovate-lanceolate. Lateral sepals strongly falcate. *Lip cordate-ovate to nearly orbicular,* scarcely 3 mm long, with 3 calli. Column-foot about equaling the column. (Fig. 2.)

Flowers reddish.
Luzon, Mindoro.

2. **E. Copelandii** Leavitt supra 203.

FIG. 3.—*Eria Copelandii*, from the type.

Stem slender, 4 mm in diameter when dry. Members of the sympodium 10–14 cm long, new growth arising 4 cm below the tip of the old. Leaves 13 cm long, 1.2 cm wide. Inflorescence many-flowered, 7 cm long, the scattered tomentum reddish. Floral bracts 2 mm long. *Flowers small, globose.* Ovary 1–2 mm long. Perianth 4 mm long. *Lip concave and scoop-like, semiorbicular when spread out, scarcely 3 mm long.* Column and foot about equal. (Fig. 3.)

Flowers rose-colored.
Mindanao.

Var. **fusiformis** Leavitt supra 204.

Apical portions of the stem thickened through several internodes, forming fusiform pseudobulbs 3–4 cm long, clothed with imbricating acuminate sheaths; racemes denser.

Flowers white with pink center.
Luzon.

3. **E. Hutchinsoniana** Ames in Philip. Journ. Sci. **2** (1907) Bot. 330; supra 204.

Very like the last. Inflorescence few-flowered. *Floral segments narrower in proportion to their length.* Dorsal sepal 1 cm long, 2.5 mm wide. *Lateral sepals triangular falcate,* somewhat acuminate, acutish, 3.5 mm wide at the base, 8 mm long. Petals lance-oblong, 8 mm long, 2.5 mm wide. *Lip in general outline ovate, the base rounded and somewhat dilated, the forward portion oblong, obtuse, total length 5 mm,* width 3 mm. (Fig 4.)

Flowers white, purple at the base inside.
Mindoro.

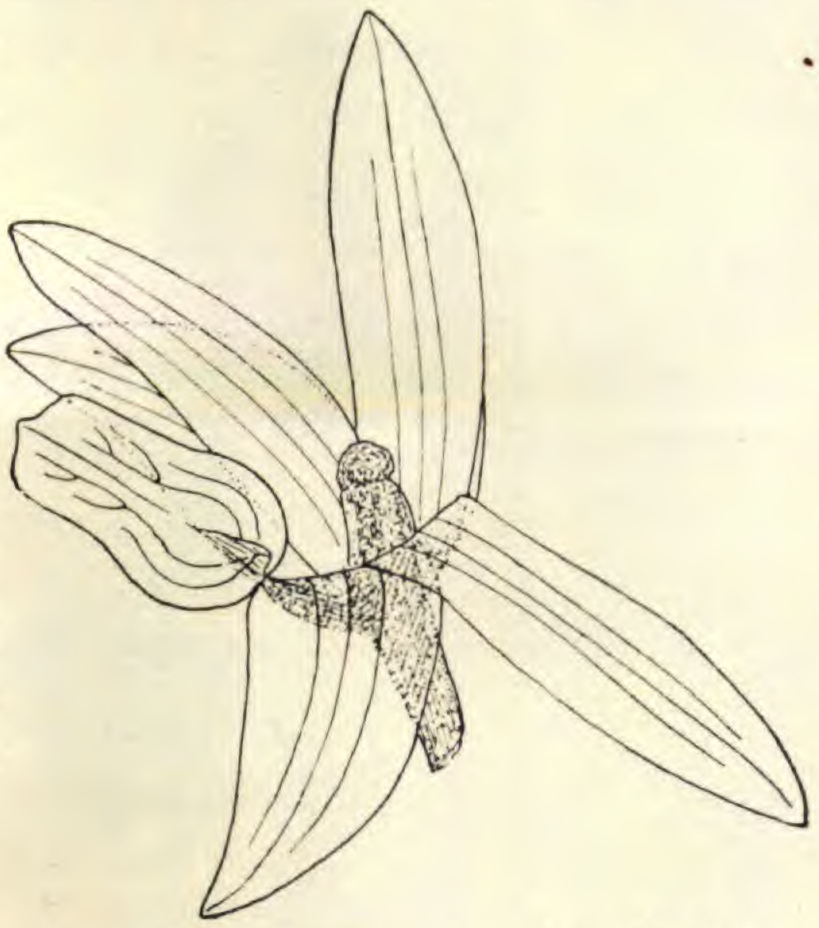

FIG. 4.—*Eria Hutchinsoniana*, from the type.

4. **E. philippinensis** Ames Orchidaceae **1** (1905) 94; supra 204.

Stem not bulbous, 5 mm in diameter when dry. Members of the sympodium 12–15 cm long, new growth arising 2–3 cm below the extremity of the old. Leaves 9 cm long, 1.4 cm wide. Inflorescences 13 cm long. *Floral bracts lanceolate, 1–1.5 cm long.* Ovary reddish-tomentose, 1 cm long. *Perianth 1.4 cm or more long.* Sepals and petals oblong, reddish when dry. *Lip broadly ovate,* scarcely 5 mm long. Foot as long as, or longer than, the column. (Fig. 5.)

Flowers white or pale-tinted, the lip red.
Luzon.

FIG. 5.—*Eria philippinensis*, from the type.

B. *Sympodium not long-creeping, slender or somewhat stout, cylindric, leaf-bearing stems relatively near together, new shoots arising near the bases of the old, and clothed by elongated, tubular sheaths (sometimes evanescent).*

* *Inflorescences near the summit, opposite the leaves.**

† *Leaves up to 30 cm long.*

5. **E. Woodiana** Ames in Philip. Journ. Sci. 2 (1897) Bot. 332; supra 205.

Stems 25 cm tall, stout, clothed with long loose thin acuminate sheaths. *Leaves* oblanceolate, acuminate, acute, *4 cm wide.* Inflorescences and leaves ±5, the former up to 15 cm long. Bracts narrow, acute, 5–8 mm long. Ovary very slender, 5–7 mm long. Dorsal sepal narrowly lanceolate, 6.5 mm long. Laterals oblong-lanceolate, acute, 6 mm long, 2 mm wide. Petals narrowly lanceolate, 5.5 mm long, 1.5 mm wide. *Lip ±4 mm long, orbicular at base, contracted at about the middle, apical half oblong, obtuse.*

Flowers pale-yellow.
Mindoro.

†† *Leaves up to 15 cm long, lip 3-lobed, flowers glabrous.*

6. **E. longicruris** Leavitt supra 205.

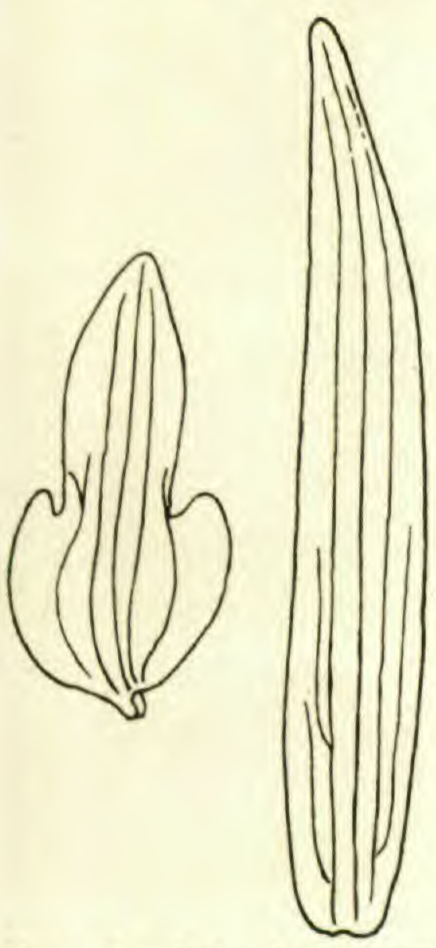

FIG. 6.—*Eria longicruris*, lip and petal from type.

Stems 30 cm tall, 2–3 mm in diameter when dry, clothed by about 6 long thin sheaths below the leaves. *Leaves narrowly lanceolate,* 15 cm long, 1.5 cm wide. Inflorescences 9 cm long. Bracts lanceolate or ligulate, 6 mm long. *Ovary very slender, 15 mm long.* Perianth 13 mm long, the segments slender. *Lip 3-lobed,* 6 mm long, the basal part rotundate, 4 mm broad, *with 3 elevated ridges, the middle one thick and canaliculate;* lateral lobes short, incurved, obtuse. Column 3 mm, foot 2 mm long. (Fig. 6.)

Flowers yellowish-white.
Mindanao.

††† *Leaves up to 9 cm long, lip entire, flowers glabrous.*

7. **E. graciliscapa** Rolfe in Ames Orchidaceae 1 (1905) 93; supra 205.

Stems clustered, slender, 21 cm tall, 2–3 mm in diameter when dry. Sheaths evanescent. *Leaves broadly lanceolate,* acuminate from near the middle, 9 cm long, 2 cm wide. Inflorescences 9 cm long, *the rachis very slender.* Bracts narrow, 3 mm long. *Ovary very slender, 5 mm long.* Perianth 4 mm long. Lateral sepals nearly ligulate, scarcely 1

* This division may be found to break down when more specimens are studied. It holds for those in hand; but too much reliance should not be placed upon it.

mm wide. Petals ligulate-lanceolate. *Lip entire, ovate-lanceolate, 2 mm long.* Column much longer than foot, *which is very short.*

Flowers yellowish.
Luzon.

†††† *Leaves not above 15 cm long, lip entire, flowers (especially the ovary) pubescent.*

8. **E. racemosa** Leavitt supra 206.

In habit very similar to the preceding. Stem somewhat stouter. *Sheaths of the stem firmer, papery.* Leaves lanceolate to lance-ligulate, 12 cm long, 1.7 cm wide. Inflorescences 14 cm long, the rhachis comparatively stout. Bracts 5 mm long. *Ovary* 7 mm long, *pubescent with reddish hairs.* Sepals ligulate, obtuse, 9 mm long, the lateral falcate. Lip ovate-oblong, 4 mm long, 2 mm wide at the rounded base, with 3 carinate calli, the middle one lowest. Column and foot equal.

Mindanao.

** *Inflorescences below the leaves as well as with them.*

9. **E. retroflexa** Lindley Journ. Linn. Soc. Bot. 3 (1859) 60; supra 206.

Stems stout. *Leaves ligulate or oblong, acutish, but not long-tapering, up to 17 cm long and 1.8 cm wide.* Inflorescences about 10 cm long, with many reflexed broadly lanceolate acuminate bracts. Sepals 8.6 mm long, 2 mm broad, the dorsal lanceolate, acute, the laterals triangular-falcate, acute. Petals lanceolate, acute, 6.4 mm long, 1.7 mm broad. Lip ovate, acuminate, acute, 3.4 mm long, 2 mm broad, thick and apparently callose on the sides near the base. This and *E. Merrittii* are very much alike. (Fig. 7.)

Flowers white.
Luzon.

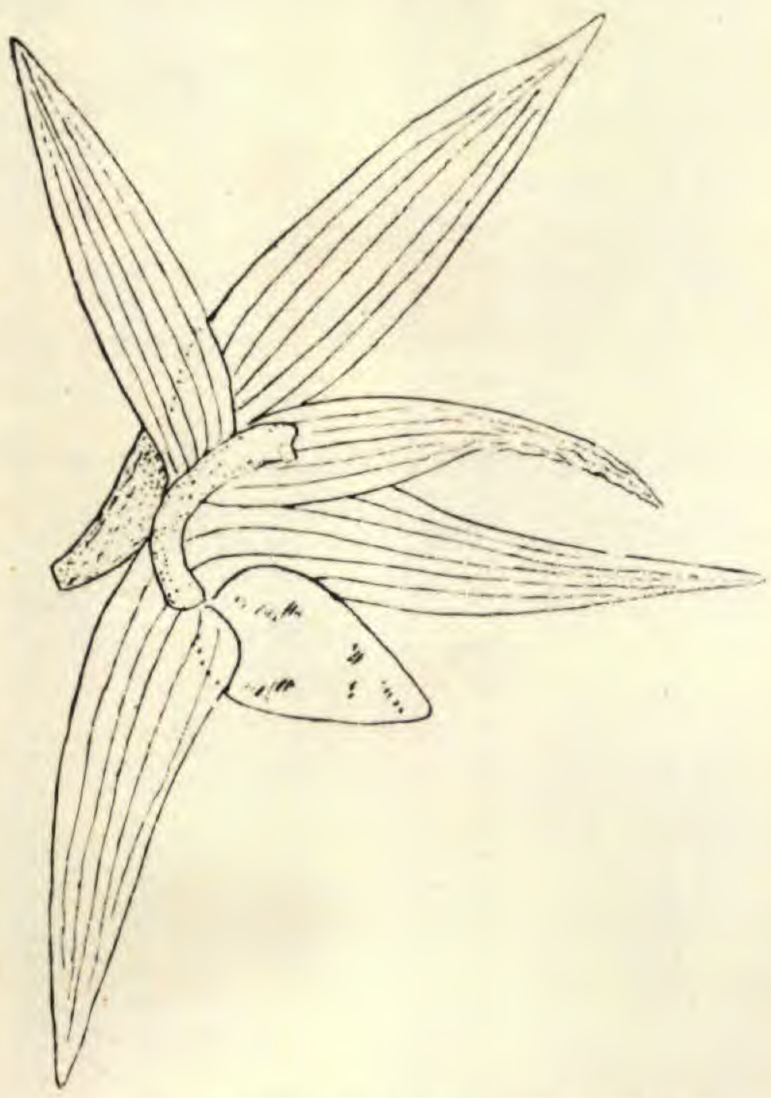

FIG. 7.—*Eria retroflexa*, from the type.

E. ringens Reichb. f. Bonplandia 3 (1855) 222. Described by Reichbenbach as follows: Stem fleshy, bulbous (cylindraceous? flattened?), when dry a half inch broad. Leaves oblong-ligulate from a cuneate base, at apex unsymmetrical, acute, three or four inches long, one inch wide. Spikes many-flowered, two or three inches long, the bracts two or three lines long, apiculate, reflexed, almost equaling the pedicellate ovary, ovate. Perianth three lines long, smooth. Sepals and petals lanceolate, acute. Lip very shortly clawed, the blade oblong, acuminate, rounded at base. Mentum obtuse. The identity of this species is doubtful.

10. **E. Merrittii** Ames in Philip. Journ. Sci. 2 (1907) Bot. 331; supra 207.

Stems 13 cm tall. *Leaves* about 4, close to the summit, *lanceolate, strongly tapering,* up to 14 cm long, 1.5 cm wide. Lateral sepals ligulate, acute, 7 mm long, 1.5 mm wide. Upper sepal similar. Petals lanceolate, acuminate, 6.5 mm long, 1.5 mm wide near the middle. Lip lanceolate, dilated and broadest at one-third the length from the base, acuminate, acute, nearly 4 mm long, 1.3 mm wide. Column and foot about equal.

Flowers white.

Mindoro.

11. **E. ovata** Lindley Bot. Reg. (1844) sub *t. 29;* supra 207.

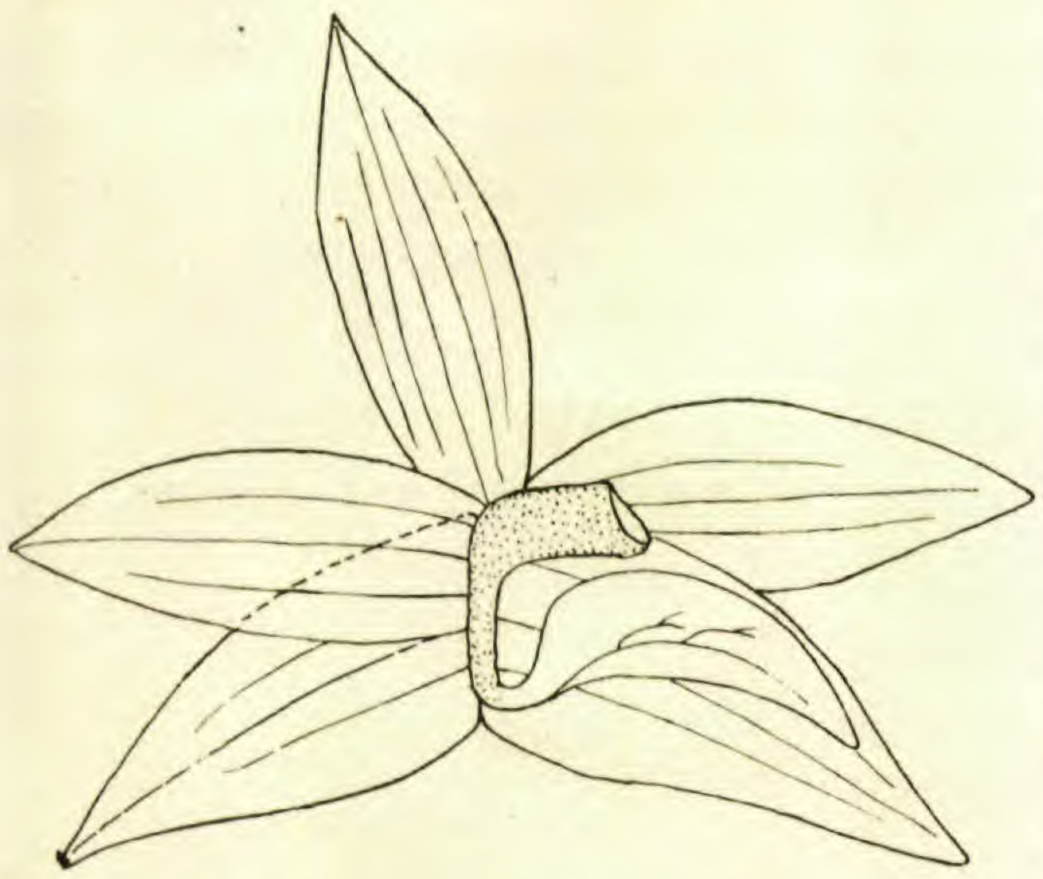

FIG. 8.—*Eria ovata*, from the type.

Leaves oblong to slightly lanceolate, obtuse, 9 cm long, 2 cm wide. Inflorescences 14 cm long. Floral bracts broadly lanceolate, the lower about 5 mm long. Ovary and pedicel 1 cm long, *ovary rather densely tomentose,* tomentum brownish or tawny. *Perianth-segments ovate.* Sepals 1 cm long, 4–4.5 mm wide. Petals equal to sepals. Lip ovate, 6 mm long, 3.5 mm wide. (Fig. 8.)

12. **E. Elmeri** Ames Orchidaceae 1 (1905) 93; supra 208.

Stems 18 cm tall, rather stout, the sheaths evanescent. Leaves very near the summit, *elliptic or oblong,* up to 8 cm long and 3 cm wide. Inflorescences several, 10 cm long. Bracts oblong, acute 6 mm long. Ovary and pedicel 5 mm long, slender. Dorsal sepal oblong-lanceolate, obtuse, 6 mm long. Laterals oblong, slightly falcate. Petals shorter, oblong-lanceolate, obtuse. *Lip* narrowly ovate, *3 mm long,* 1.5 mm wide with two calli. Column and foot about equal, the former enlarged above. Flowers often larger than as stated above. (Fig. 9.)

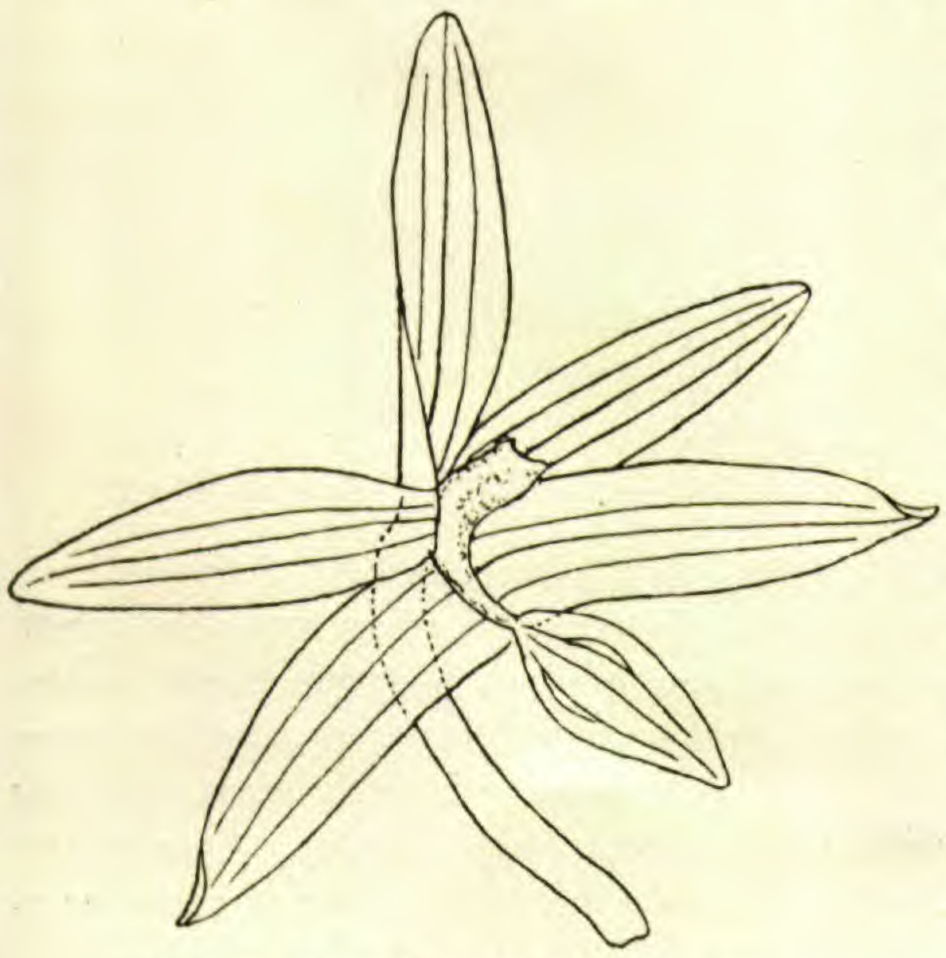

FIG. 9.—*Eria Elmeri*, from the type.

Flowers yellowish or white with a purple-stained lip.

Luzon.

13. **E. compacta** Ames in Philip. Journ. Sci. **2** (1907) Bot. 329; supra 208.

Stems close together, thickened at base, *5 cm high*. *Leaves* at summit, 3, *elliptic or elliptic-lanceolate, obtuse, 5.5 cm long, 1.4 cm wide*. Bracts ovate, 4–5 mm long, half as broad. Ovary sparsely pubescent when young, 4 mm long. Perianth 6 mm long. Lateral sepals triangular-acute, concave and 2.5 mm wide at base. Petals broadly lanceolate, acute, nearly equaling sepals, 2 mm wide. Lip ovate, inclining to cordate at base, 4 mm long, nearly 2 mm wide at base. *Column distinctive; wide throughout, concave, 2 mm high and nearly as broad,* plainly exceeding the upturned foot. Mentum rounded. Like *E. Elmeri* but smaller, the floral parts slightly, and the column quite different.

Mindoro.

14. **E. floribunda** Lindley Bot. Reg. (1843) Misc. 43; (1844) *t. 20;* supra 209.

A robust plant, the stems stout and 30 cm or more high. Leaves about 7, lanceolate, evenly tapering to base and apex from near the middle, acute, up to 22 cm long and 3 cm wide. Inflorescences about 3, pubescent, about 6 cm long, densely flowered. Bracts broad, concave, blunt, about 2 mm long. Ovary pubescent, 2 mm long. Flowers not exceeding 4 mm in greatest diameter, roundish with a pronounced chin. Sepals rounded, the dorsal strongly cucullate, 3 mm long and as broad, the laterals broadly and unsymmetrically ovate, blunt, 4 mm long and nearly as broad at base. Petals oblong-falcate, acutish, about 3 mm long. *Lip peculiar, concave at base, by the elevation of the sides, which are produced forward into angles or short horns, connected by a cross-wall; the basal portion of the lip thus forming a sort of scoop with 2 forward-projecting corners; in front, as from the floor of this concave basal portion, the lip is continued by a narrow, somewhat thickned isthmus shortly expanding into a flabellate limb.* Lip about 4 mm long. The limb above 2 mm wide. Column short, thick, much exceeded by the foot. (Fig. 10.)

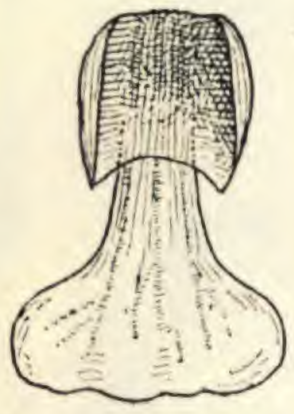

FIG. 10.—*Eria floribunda*, lip.

Flowers white.

Palawan: Malay Archipelago to India.

§ **HYMENERIA** Lindley in Journ. Linn. Soc. Bot. **3** (1859) 52.

Not strictly separable from § *Urostachya,* but stems typically stout and pseudobulbous, clustered, with few leaves; inflorescences 1 or 2, stout, produced from the pseudobulbs; flowers often larger and fewer than in § *Urostachya,* not densely and extremely woolly as in § *Dendrolirium;* lip generally 3-lobed.

15. **E. bractescens** Lindley Bot. Reg. (1841) Misc. 18, and (1844) *t. 29;* Ames Orchidaceae **2** (1908) 189; supra 209.

Pseudobulbs various, short and bulbous or up to 18 cm long and stem-like. Leaves about 3 at the summit, broadly oblanceolate, up to 25 cm

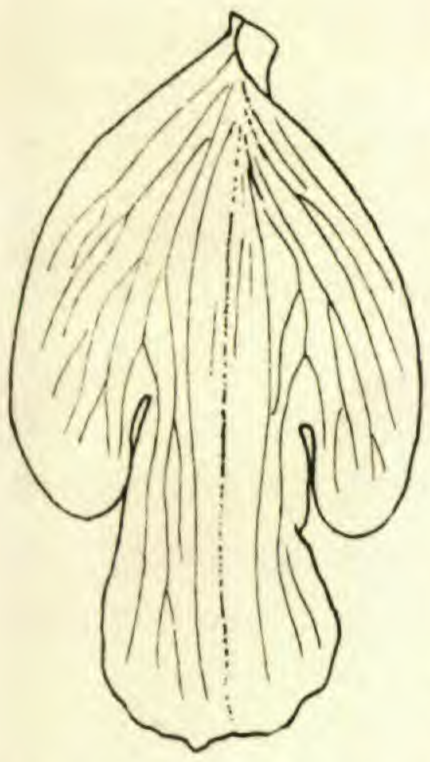

FIG. 11—*Eria bractescens*, lip.

long and 4 cm wide. Inflorescence mostly 1, up to 20 cm long, conspicuous for the oblong bracts (sometimes broadened toward the apex), *which are up to 2.5 cm long and 4–8 mm wide.* Ovary and pedicel thin, up to 2.5 cm long. Dorsal sepal 1 cm long, 2.5 mm wide, lance-ligulate. Laterals strongly falcate, tapering from the base, or nearly oblong, about 1 cm long, 3 mm wide. Petals nearly equal to sepals, lance-ligulate, slightly falcate, obtuse, 2.5 mm wide. Lip 3-lobed, 9 mm long, 6 mm wide, ovate to cuneate-obovate in general outline; carinæ 3, the middle extending into the middle lobe, the laterals ending below the sinuses, or extended to the middle lobe; papillæ scattered and in lines on the middle lobe; lateral lobes obtuse, slightly incurved, oblong or ovate; middle lobe much larger, oblong to obovate, rounded or truncate at the extremity. Column and foot nearly equal. (Fig. 11.)

Flowers creamy white.
Luzon, Mindanao, Basilan.

Var. **latipetala** Leavitt supra 210.

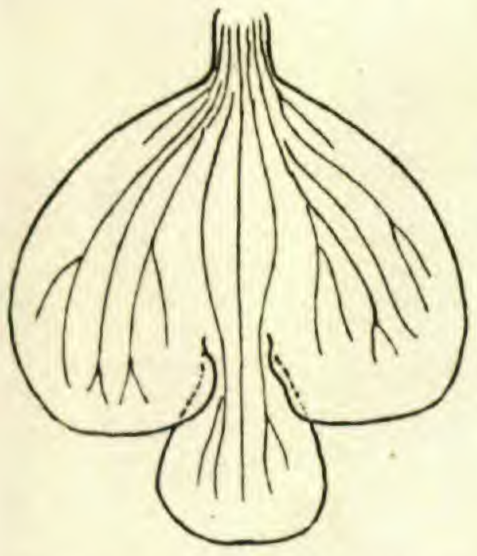

FIG. 12.—*Eria bractescens*, var. *latipetala*, lip from the type.

The petals somewhat broader than in the species, deeply stained with red or purple, visibly shorter than the dorsal sepal; the lip approaching orbicular in general outline, 8 mm long, 7 mm wide, shortly clawed, the lateral lobes larger than the middle, rounded, truncate, tinged with red. (Fig. 12.) Pseudobulbs short and stout.

Flowers white, the petals deeply stained with red or purple.
Luzon.

16. **E. longilabris** Lindley Bot. Reg. (1841) Misc. 38, and (1844) *t. 29, f. 3;* supra 210.

With the appearance of *E. bractescens,* but with petals and sepals more acuminate, and the mid-lobe of the lip longer, acuminate, the lateral lamellæ produced nearly to the apex.

Panay.

17. **E. Curranii** Leavitt supra 210.

Pseudobulbs cylindraceous, 6 cm high. Leaves 2, lance-oblong, obtuse, 10 cm long, 2 cm broad. Inflorescence 15 cm long. Raceme loosely flowered, the rhachis sparsely pubescent. Bracts broad, 6 mm long. Ovary and pedicel very slender, 1 cm long, pubescent. Mentum conspicuous, conical or oblong, making an acute angle with the ovary. Dorsal sepal ovate, 5 mm long, 2.5 mm wide. Laterals triangular-falcate, acute, 5 mm long, 4 mm wide at base. Petals oblong, 5 mm long, 1.7 mm broad. *Lip* unguiculate, the claw curved, *cuneate-obcordate; mid-lobe obcordate,* 3 mm broad; lateral lobes rounded; entire lip 6 mm long, nearly 4 mm broad; carinæ on disc 3, the middle one least. Column 2 mm high, foot 4 mm long. (Fig. 13.)

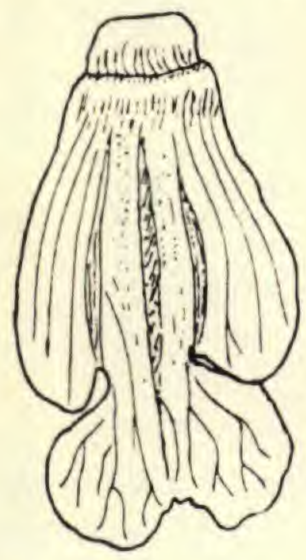

FIG. 13.—*Eria Curranii*, lip from the type.

Palawan.

18. **E. profusa** Lindley Bot. Reg. (1842) Misc. 2; supra 210.

Pseudobulbs clustered, spindle-ovate, up to 7 cm long and 3 cm in diameter (dry), of a few internodes, imperfectly clothed with broad papery or scarious sheaths, the uppermost foliaceous. Leaves 4, oblong-lanceolate, acutish, up to 20 cm long, 3 cm wide. Inflorescences 2 or 3, erect, with soft downy brown pubescence throughout, up to 30 cm tall, exceeding the leaves, the rather stout peduncle about two-fifths the length of the whole, bearing a few small ovate bracts; raceme not extremely dense, about 2.5 cm in diameter. Ovary with pedicel 7 mm long. Dorsal sepal 5 mm long, elliptic-oblong, obtuse, 3 mm wide. Laterals unsymmetrically ovate, obtuse, 5 mm long, 5 mm broad along the foot. Petals oblong, obtuse, 5 mm long, not 2 mm wide. Lip in general outline cuneate-obovate, strongly three-lobed, 6 mm long, 4 mm wide across the lateral lobes; lateral lobes erect, oblong, slightly curved; middle lobe recurved, semiorbicular to reniform, with a large tubercle near the apex. (Fig. 14.)

FIG. 14.—*Eria profusa.*

Flowers pale, with markings of yellow and purple.

Luzon, Negros Oriental.

19. **E. cylindrostachya** Ames Orchidaceae 2 (1908) 190; supra 211.

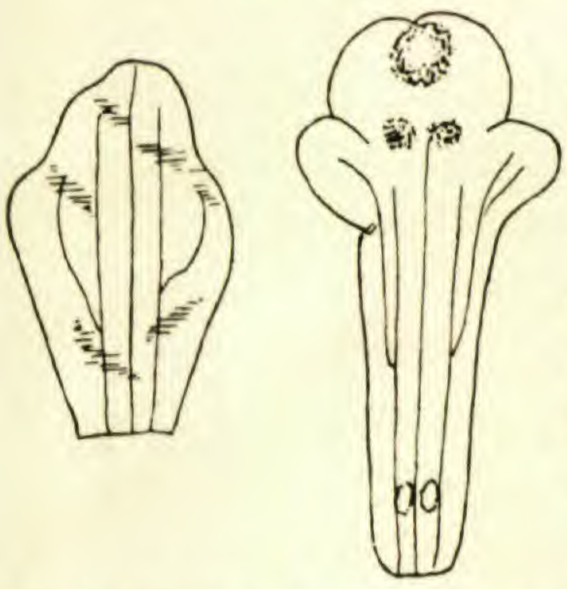

FIG. 15.—*Eria cylindrostachya*, lip and petal from the type.

Very much like the last. Inflorescence shorter than the leaves, the down not so long nor so dense, the raceme much denser-flowered and shorter-peduncled. Leaves longer-petioled and proportionately narrower than in the last, up to 37 cm long and 2 cm wide. Petals wider, obovate. Lip narrower (but variable). (Fig. 15.)

Flowers yellowish-white.
Mindanao.

20. **E. ventricosa** Leavitt supra 211.

Pseudobulbs nearly cylindric, somewhat thickened below, about 3 cm long; sheaths several, ovate, 3 cm long, entirely concealing the stem. Leaves 2, lanceolate to oblancéolate, short-petioled, up to 14 cm long and 1.5 cm wide. Inflorescences 1 or 2, 5.5 cm long, pubescent; peduncle 2 cm long, very slender, with 2 or 3 amplexicaul sheaths, sparsely white-tomentose. Flowers about 12, subtended by ovate, concave, ciliate-margined bracts, as long as the ovary and pedicel, which is white-tomentose, about 3 mm long. Dorsal sepal obovate, sparsely pubescent, 5 mm long, about 3 mm wide. Laterals pubescent, inflated, triangular-oblong, 4 mm long, 2 mm broad, the anterior margin sigmoid. Petals oblong-obovate, somewhat falcate, 4 mm long by 2 mm wide. *Lip 5 mm long, ventricose at base* (2 mm), *the limb flabellate-trilobed*, 4 mm broad; lateral lobes erect, triangular-oblong, apex rounded; mid-lobe reflexed, broadly triangular-semiovate. Foot of column straight, nearly linear, expanded where it joins the lip, 4 mm long, the column scarcely 2 mm long. For variations see discussion of this species above. (Fig. 16.)

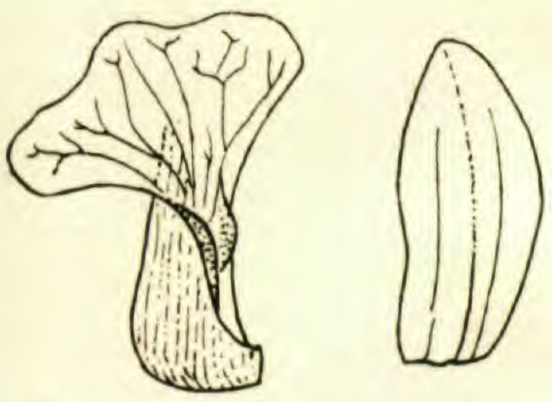

FIG. 16.—*Eria ventricosa*, lip and petal from the type.

Flowers cream-white.
Luzon, Negros Occidental.

Var. **benguetensis** Leavitt supra 212.

Differs from the type in its larger flowers, longer bracts, and narrower petals.

Luzon.

21. **E. Lyonii** Leavitt supra 212.

Rhizomatose portions of the sympodium stout and woody, when dry 5 mm in diameter. Pseudobulbs 2–5 cm distant, ovoid, 2.5 cm high,

1.5 cm in diameter when dry. Leaves 2, lanceolate to oblanceolate, acuminate, 24 cm long, 2.5 cm broad. Inflorescence arising near summit of pseudobulb, erect, more than 10 cm long, the peduncle stout, the rhachis angled. Flowers 15 (?), sessile, not crowded, pubescent. Ovary 5 mm long, covered with short rufous tomentum. Dorsal sepal lance-ligulate, acute, 1 cm long, 3.5 mm broad. Laterals triangular-falcate, acute, 1 cm long, 3.5 mm broad. Mentum conical, somewhat acute, nearly 3 mm long. Petals lance-ovate, somewhat falcate, acute, 1 cm long, 4 mm broad. Lip ovate, 3-lobed, 8 mm long, 4 mm broad; mid-lobe obovate-oblong, acute, 4 mm long; side lobes at about the middle, rounded; on the disc 3 raised carinæ Column stout, 2 mm high, the foot long, broad and concave. (Fig. 17.)

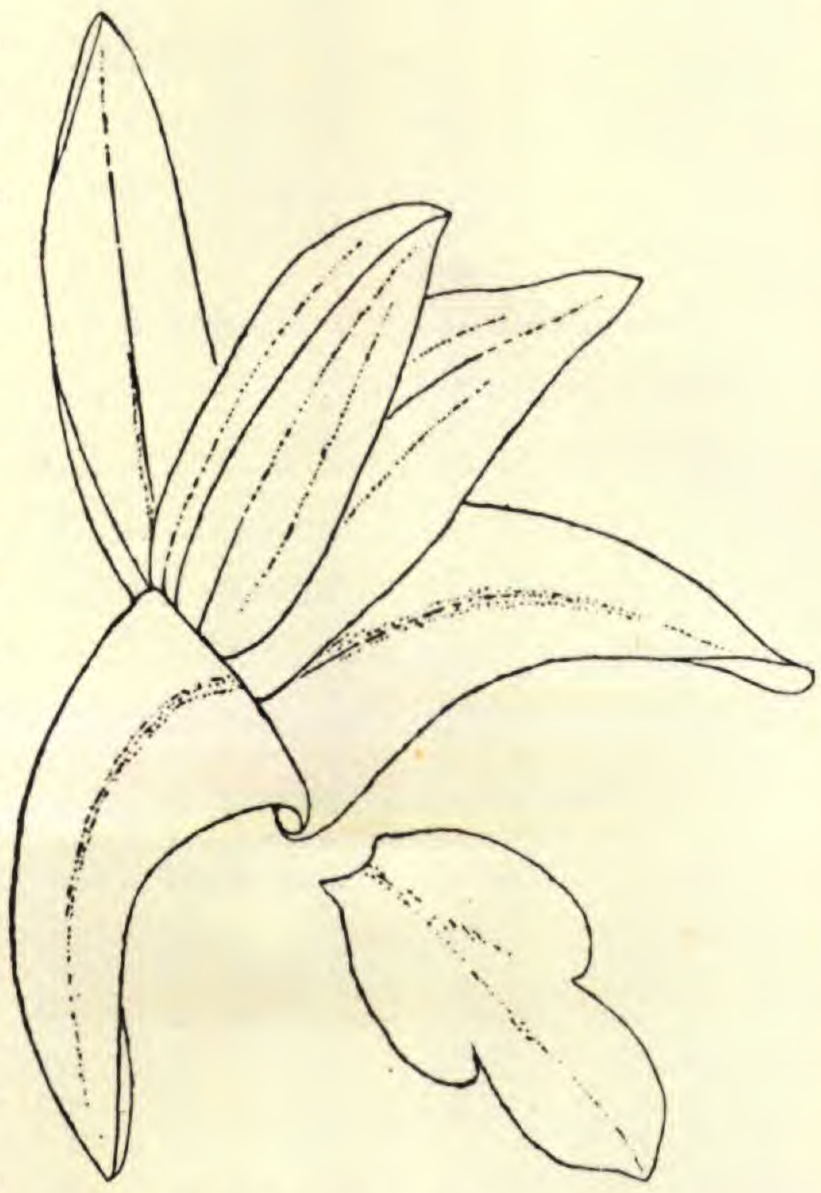

FIG. 17.—*Eria Lyonii*, from the type.

Flowers dull-yellow clearly lined with red, the lip clear white with yellow base.

Luzon.

22. **E. rugosa** Lindley Orch. Pl. (1830) 66; Ames Orchidaceae 2 (1908) 193 in syn.; supra 212.

E. stellata Lindley Bot. Reg. (1825) *t. 904.*

Pseudobulb small, up to 5 cm long, clothed and exceeded by 2 or 3 large ovate acuminate bracts springing from the base. *Leaves* 2 from the summit, oblanceolate, acuminate, acute, *up to 30 cm long and 2 cm wide.* Inflorescences 1 or 2, stout, up to 45 cm long, long-pedunculate, bracts broadly lanceolate, acuminate, acute, up to 1.5 cm long. *Ovary* and pedicel tomentose, *not winged,* 7–9 mm long. Flowers large, the sepals pubescent, sepals and petals narrow, acuminate from the base, the dorsal sepal up to 1.8 cm long. Mentum 3 mm long, pointed. Lip 12 mm long, 4–5 mm wide, constricted at the middle so as to appear weakly 3-lobed, with 3 carinæ nearly the entire length, the basal half obovate, the apical oblong, acuminate, acute.

Luzon: New Guinea to Malay Peninsula.

23. **E. Merrillii** Ames Philip. Journ. Sci. 2 (1907) Bot. 331; supra 213.

Very like the preceding. Pseudobulb large and stout, up to 13 cm long, not concealed by the several large acuminate sheaths springing

from the base. Leaves 2 or 3, *up to 64 cm long and 7 cm wide.* Inflorescence 36 cm long. *Ovary tomentose, strongly winged and twisted. Lip strongly 3-lobed,* the laterals obtuse and somewhat incurved, the middle lobe somewhat expanded, acute; carinæ prominent, 5.

Flowers nearly white, purple-tinged.
Mindoro.

§ **AËRIDOSTACHYA** Hooker f. Fl. Brit. Ind. **5** (1890) 786.

Pseudobulb cylindric to conical, covered by several large coarse imbricating sheaths; leaves few, at the summit; inflorescences 1 or 2, from near the summit of the pseudobulb, stout-peduncled, the raceme cylindric, recurved, with extremely numerous dense rusty flowers; dorsal sepal and column very short; the foot prolonged, the mentum therefore very conspicuous, cylindric or inflated at apex. (Fig. 1.)

24. **E. Whitfordii** Leavitt supra 215.

Very similar to *E. Aëridostachya.* Plant robust. Pseudobulbs up to 10 cm long, the coarse sheaths large, ovate below, the upper up to 12 cm long; when dry and pressed the *bulbs with sheaths 7 cm wide. Leaves* 2 or 3, *up to 37 cm long and 5 cm broad.* Peduncle up to 17 cm long, 2 mm in diameter (dry). Rachis 14 cm long, densely short-brown-tomentose, appearing pulverulent. Raceme scarcely 2 cm in diameter. Bracts broadly ovate, cucullate, 1 mm long. Flowers externally densely short-tomentose or pulverulent, tomentum ferrugineous. Ovary with pedicel 6 mm long. Mentum 3 mm long, making an acute angle with the ovary. Dorsal sepal ovate-oblong, cucullate, 4.5 mm long, 2.6 mm wide. Laterals broad, obtuse, falcate, produced along the foot, 12 mm in greatest extent. Petals ligulate, curved, apices rounded, 3.8 mm long, 1.6 mm broad. *Lip* thickish, *entire,* when spread out oblong-ovate, the margin crisped, 6 mm long and 4 mm broad, with a minute cusp at the apex. Foot of column curved.

Flowers yellow.
Luzon, Negros Occidental.

25. **E. Mearnsii** Leavitt supra 216.

Much like the preceding, but not so robust. *Sheaths closer, the whole when dry about 2 cm in diameter.* Leaves 2, up to 25 cm long and 3.5 cm broad. Inflorescences 2, up to 21 cm long, the raceme 1.6 cm in diameter. Ovary with pedicel 4–5 mm long. Mentum forming an acute angle with ovary, 3 mm long. Dorsal sepal 3.7 mm long, 2 mm broad. Laterals 10 mm in greatest extent. *Petals considerably curved, at base broader. Lip 3-lobed,* cuneate-obovate or obovate, 4.5 mm long, 3 mm broad, concave at base; lateral lobes small and tooth-like, obtuse; mid-lobe large, broadly ovate or semiorbicular, acute, the margin

crisped. Foot curved, 3 mm long. Column (exclusive of anther-cap) scarcely 1 mm high.

Flowers reddish.
Mindanao.

§ **DENDROLIRIUM** Lindley Journ. Linn. Soc. Bot. **3** (1859) 48.

Coarse pseudobulbous plants, with thick leathery leaves, and rather large woolly flowers, the large stout inflorescence arising from beneath the pseudobulb.

26. **E. ornata** Lindley Orch. Pl. (1830) 66; supra 217.

Pseudobulbs connected by stout woody stems 6 mm in diameter, the bulbs flattened, sheathed below, 4–8 cm long, 2–3 cm broad when dry. Leaves about 3, very thick and stiff, lanceolate, elliptic or oblong, usually about 16 cm long and 3 cm wide, up to 23 cm long and 5 cm wide. Inflorescence upright, rigid, up to 34 cm tall, the peduncle with coriaceous sheaths at base, longer than the raceme. Floral bracts broadly lanceolate to ovate, up to 3 cm long, very pointed, thinly woolly-pubescent, brilliantly colored. Ovary and pedicel up to 3.5 cm long, densely tomentose. Sepals about 12 mm long, blunt, the dorsal lance-ligulate, 3 mm wide, the laterals triangular-falcate, 7 mm wide along the column-foot. Petals nearly as long, narrowly lanceolate, 2 mm wide. Lip 13 mm long, 5 mm wide, weakly lobed by abrupt constriction below the middle, the terminal lobe with oblong isthmus 5 mm long, expanded, crispate and pointed; the disk with lamellæ.

Flowers salmon without, velvety white inside; the bracts orange.
Luzon, Negros Occidental: Sumatra, Java, Borneo.

§ **MYCARANTHES** Reichb. f. in Bonplandia **5** (1857) 55.

Plants tall, leafy throughout, the stem concealed by the persistent bases of the leaves, which are glabrous; inflorescences several, from the summit, long, many-flowered, very pubescent; flowers small, the ovary and at least the base of the perianth densely woolly-white-tomentose; lip 3-lobed with abundantly farinose calli; foot much exceeding the column.

27. **E. anceps** Leavitt supra 219.

Stems up to 25 cm high, internodes 4–5 cm long. *Sheathing bases of leaves* 5 cm long, *somewhat compressed and slightly carinate on the back; the lamina lanceolate or lance-ligulate, up to 18 cm long and 3 cm wide,* acute. Racemes 2 or 3, sparsely lanuginose, up to 17 cm long; peduncle 3 cm long. *Bracts lanceolate, very acuminate,* reflexed, *2–3 mm long.* Pedicel and ovary 7–9 mm long. *Dorsal sepal* ovate-cymbiform or oblong, 3.5 mm long, 2.5 mm broad when spread. Laterals broadly ovate, asymmetrical, obtuse, 4–5 mm long, 4 mm wide

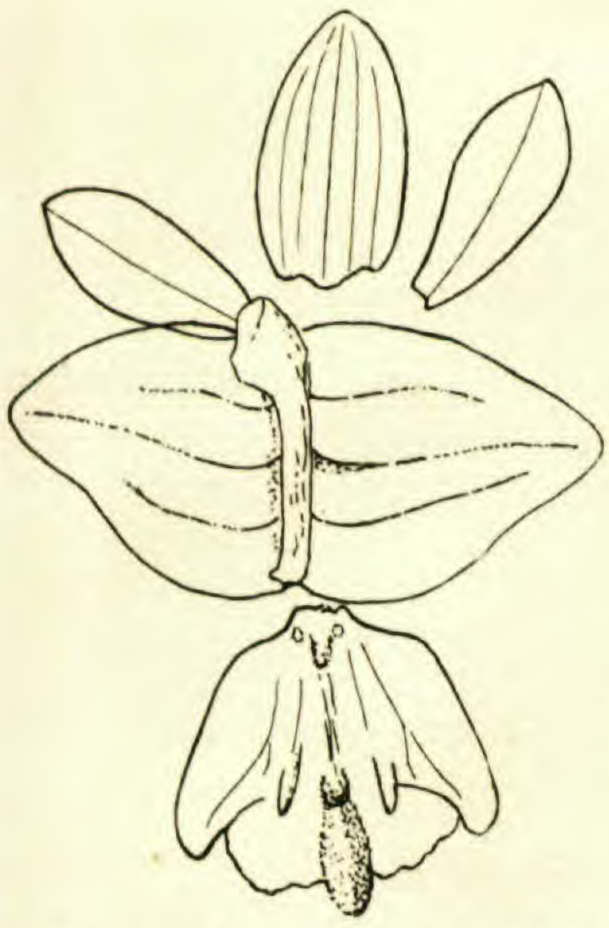

FIG. 18.—*Eria anceps*, from the type.

at base. Petals oblong, obovate, or spathulate, 4 mm long, 1.8 mm wide. Lip very broadly obovate, 3-lobed, 4 mm long, 5 mm board; lateral lobes oblong, the apices rounded; middle lobe subquadrate or reniform, the margin crenulate; tubercles or calli 7, 3 at the base, 1 linear near the end of each sinus, 2 on the mid-lobe, the largest subulate or clavate, copiously farinose, almost 2 mm high from the middle of the lobe. *Foot of the column 3 mm long, making an oblique angle with the ovary.* Column almost none. (Fig. 18.)

Flowers yellow.
Palawan, ? Negros.

28. **E. longibracteata** Leavitt supra 219.

Stem up to 45 cm tall, internodes 4 cm long. Leaves narrowly lanceolate or *gramineous, long attenuate, very acute, lamina up to 21 cm long and 1 cm wide.* Racemes 2–4, pedunculate, the whole up to 23 cm long. *Bracts conspicuous, the lower sometimes foliaceous,* lance-linear, *up to 6 cm long and 4 mm wide; floral bracts narrow and very acute, up to 20 cm long.* Ovary and pedicel 5 mm long and over, the ovary rapidly growing, soon after anthesis attaining a length of 28 mm. *Sepals 3.6 mm long,* the dorsal cymbiform-ovate, the laterals triangular, somewhat falcate, acute, 3 mm wide at base. Petals almost elliptic, somewhat asymmetrical, obtuse, 3.5 mm long, 1.9 mm broad. Lip 3-lobed, obovate, short-clawed, and somewhat cuneate, 4 mm long, 3.5 mm broad. Lateral lobes almost semiovate; mid-lobe bilobulate, 0.8 mm long, 2 mm broad; at base of lip 1 erect bifurcate, farinose callus, and 2 small ones; on either side of the disc, remote from the sinus, a carinate dentiform callus; and from the center of the mid-lobe a very large erect conical farinose callus. *Foot making a right angle with the ovary, 2 mm long.* Column very short. (Fig. 19.)

FIG. 19.—*Eria longibracteata*, from the type.

Flowers purplish.
Mindanao.

29. **E. Clemensiae** Leavitt supra 220.

Stems up to 45 cm tall, the internodes 5 cm long. Sheaths of the leaves cylindraceous, 5 cm long, 8 mm in diameter when dry; *lamina*

ligulate-lanceolate, acuminate, acute, *up to 22 cm long, and 4 cm broad.* Inflorescences 3 or 4, *peduncles 15 cm long,* sparsely white-woolly; *racemes up to 37 cm long,* the rachis pubescent, the reflexed *bracts ovate or ovate-lanceolate, acuminate, 3–5 mm long. Sepals* outwardly sparsely stellate-pubescent; the dorsal cucullate, oblong, *4–5 mm long,* 2 mm wide; laterals oblong, falcate, oblique, obtuse, 6–7 mm long from end of foot to apex of sepal, 5 mm wide, 3 mm wide on the column-foot. *Lip with lateral lobes ligulate, divaricate from the base of the lip,* obtuse, 5 mm long, 2 mm wide at base; *mid-lobe clawed, flabellate or obscurely 2-lobulate,* 2 mm long, 4 mm broad; calli 4, one at base of lip farinose, 2 subulate near each sinus, 1 large, rostriform, copiously farinose, protruding beyond the mid-lobe, terminating a fleshy farinose median carina. Foot of column 3.5 mm long. (Fig. 20.)

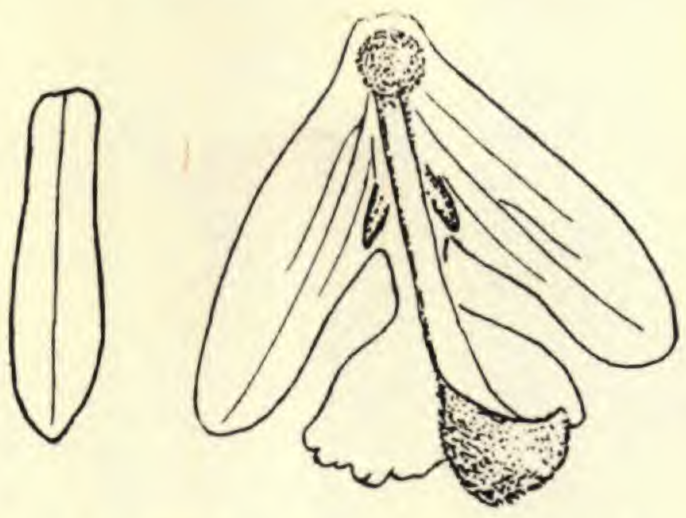

FIG. 20.—*Eria Clemensiae,* lip and petal from the type.

Mindanao.

30. **E. major** Ridley ex Stapf in Trans. Linn. Soc. Bot. II 4 (1894) 237, in synonymy; supra 218.

Stem 40 cm or more tall. *Leaves lance-ligulate, up to 17 cm long and 1.6 cm wide.* Inflorescences 5, rather densely white-tomentose, the flowers crowded, woolly; *bracts very narrow and sharp, 5–15 mm long.* Ovary and pedicel 8 mm long. *Dorsal sepal* oblong, cucullate, *5 mm long,* 2 mm broad, obtuse. Lateral sepals unsymmetrically ovate, 5 mm long, 4 mm broad, blunt, *densely hairy to the apex.* Petals spathulate-oblong, scarcely 5 mm long and 2 mm wide, blunt. Lip in general outline nearly orbicular, deeply 3-lobed at about the middle, the lateral lobes triangular-falcate, pointed; *the middle lobe reniform or bilobulate,* apiculate, *extending as widely as the lateral lobes.* Farinose calli 2, one at the base of the lip, small and 3-lobed, one very large and bluntly boat-shaped, nearly 2 mm high from the middle of the mid-lobe, one smooth pointed callus near each sinus; entire lip 4 mm long, 5 mm wide.

Flowers purplish tinged.
Mindanao: Borneo, India.

31. **E. gigantea** Ames Orchidaceae 2 (1908) 192; supra 218.

Stems often extremely robust, up to 60 cm tall, 3 cm in diameter at the base. Internodes 3 to 4 cm long. *Leaves rather crowded,* linear or slightly lanceolate, acuminate, *up to 30 cm long, 3 cm wide.* (A form has leaves up to 32 cm long and less than 2 cm wide.) Inflorescences 3 or 4, up to 20 cm long, peduncle and rachis stout, not very densely white-tomentose. *Bracts oblong or ovate, obtuse or apiculate, fleshy,* up

to 3 mm long. *Dorsal sepal* oblong-ovate, acutish, *5 mm long.* Laterals triangular-ovate, 5 mm long, 3 mm wide at base, 4 mm broad, somewhat acuminate, the pubescence much denser at the base, sparse toward the thickened tip. *Petals linear or sometimes lanceolate,* obtuse or acute, 4 mm long, *1 mm wide.* Lip broadly obovate in general outline; *the lateral lobes* broadly rounded, somewhat pointed, their inner margins nearly straight, *extending much more widely than the mid-lobe;* mid-lobe semicircular, erose-margined, thin and soon shriveling; farinose calli at base (3) and on the middle of the mid-lobe (2); a smooth, pointed callus near each sinus. Lip 5 mm long, about as broad. (Fig. 21.)

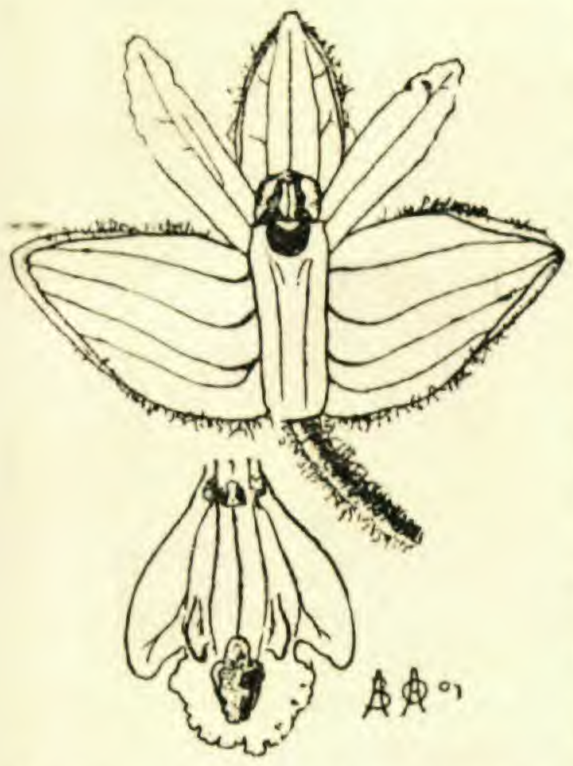

FIG. 21.—*Eria gigantea*, from the type, drawing by Ames.

Flowers yellowish-green, the sides of the column and foot tinged, the sepals and lip spotted with brown-purple.

Luzon, Mindanao.

§ **CYLINDROLOBUS** Blume Mus. Bot. Lugd.-Bat. 2 (1856) 182.

Stem tall and relatively slender, the internodes 2–3 cm long, leafy (and sheathed by leaf-bases) throughout most of its length; leaves slender, glabrous; inflorescences from the sides of the stem, short, few-flowered and glabrous throughout.

32. **E. fastigatifolia** Ames Orchidaceae 2 (1908) 191; supra 221.

FIG. 22.—*Eria fastigatifolia*, from the type, after Ames.

Stems up to 135 cm tall and 7 mm in diameter when dry. *Leaves* gramineous, pointed, *up to 25 cm long,* 0.8 cm wide. *Inflorescences more or less than 4 cm long,* the peduncle about one-third of the whole. Bracts lanceolate to ligulate, acuminate, acute, up to 8 mm long. *Flowers up to 9 or 10.* Ovary and pedicel 9 mm long. Mentum making an acute angle with the ovary. Flower 8 mm in extent from end of mentum to tip of dorsal sepal. Dorsal sepal elliptic-oblong, 5 mm long, 3 mm wide. Laterals unsymmetrically ovate-oblong, 5 mm long, 3 mm broad. Petals oblong-spathulate, 4 mm long, less than 2 mm wide. *Lip* cuneate at the base, *weakly 3-lobed near the middle;* the lateral lobes triangular, pointed; the middle lobe somewhat bilobulate, erose-margined; several papillæ in oblique lines below the middle. Column exceeding the foot. (Fig. 22.)

Flowers white and pink, petals and labellum with marginal pinkish streaks.

Luzon, Mindanao.

33. **E. brachystachya** Reichb. f. Bonplandia 3 (1855) 223; supra 221.

Stem up to 60 cm high, 4 mm in diameter when dry, leafy through three-fifths or more of its extent. *Leaves* narrowly linear-lanceolate, *about 10 cm long,* 0.8 cm wide, obtuse. *Peduncle 1 cm or less long,* 4- or 5-bracteate, bracts linear, about 1 cm long. *Flower solitary.* Ovary with pedicel 7 mm long. Mentum making a right angle with ovary. Perianth nearly 10 mm long. Dorsal sepal oblong, 4 mm wide, obtuse. Laterals triangular-falcate, 5 mm broad at base. Petals oblong-falcate, obtuse, 9 mm long, 4 mm broad. *Lip* somewhat cuneate at base, *strongly 3-lobed in front, the side lobes curved and exceeding the mid-lobe,* the latter rounded, broader than long; the disc and mid-lobe thickened and papillose; entire lip 6 mm long and wide. Column and foot about equal.

Flowers white, the middle of the lip yellow.
Mindanao, Camiguin (Babuyanes).

34. **E. vulpina** Reichb. f. in Bonplandia 3 (1855) 222; supra 222.

Stems up to 80 cm high, 0.6 cm in diameter when dry. Internodes 3–4 cm long. Leaves oblong to lanceolate, unsymmetrically acuminate, up to 14 cm long and 2.8 cm wide. Inflorescence 10–20 cm long. Bracts broadly cordate, 1.2 cm long, nearly as wide, acuminate, 1–2 cm distant. Dorsal sepal oblong, 13 mm long. Laterals triangular-falcate, acute, 10 mm long, 8 mm wide along the foot. Petals curved, oblong to spathulate, rounded at the tip, 7 mm long, 2 mm or more wide, externally pubescent. Foot 7 mm long. Lip 9 mm long, unguiculate, dilated into a somewhat quadrate blade which is weakly 3-lobed. Mentum rounded, strongly outstanding. (Fig. 23.)

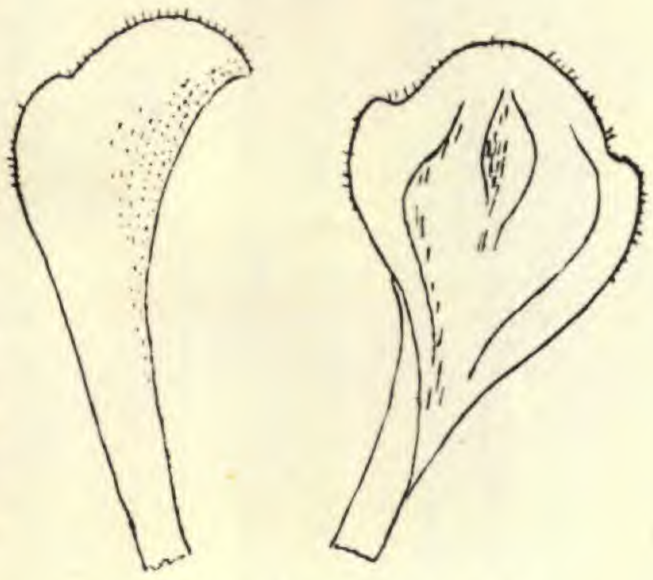

FIG. 23.—*Eria vulpina*, lip.

Flowers flesh-color.
Luzon, Mindoro, Mindanao.

35. **E. fusca** Blume Mus. Bot. Lugd.-Bat. 2 (1852) 183; supra 222.

Stems up to 80 cm tall, 0.5 cm in diameter when dry, the internodes 2–3.5 cm long. Tomentum on leaf-bases dark, dense, fine, short and somewhat appressed. Leaves lanceolate, acuminate, acute, up to 10 cm long, up to 1.8 cm wide, clothed when young with a short, dark-reddish pubescence. Inflorescence 4 cm long, the ovate acuminate bracts 8 mm long, 5 mm wide, 0.5 cm distant. Dorsal sepal oblong, 8 mm long, 3 mm wide. Laterals triangular-falcate, 7 mm long on the margin next to the dorsal, 8 mm broad along the foot, acute, somewhat carinate. Petals linear or spathulate, 7 mm long, less than 2 mm wide. Foot 6 mm long. Mentum cylindraceous, curved and standing out. Lip 11 mm long, 7 mm broad across the terminal lobe, unguiculate, 3–lobed by a sharp constriction 3.5 mm from the end, the middle lobe widest, broadly flabellate or somewhat reniform, retuse; elevated lines of the disc 3.

Negros: Java.

36. **E. binabayensis** Ames in Philp. Journ. Sci. 2 (1907) Bot. 329; supra 223.

Plants up to 5 dm tall. Leaves oblong-lanceolate, acuminate, 1 dm long, 2 cm wide. Inflorescence 3 cm or more long, the bracts about 1 cm long. Dorsal sepal oblong. Lateral sepals triangular-lanceolate, 1 cm long, 8 mm wide at base. Petals linear-spathulate, obtusish, 8.5 mm long, 2 mm wide about the middle. Lip 10 mm long, narrowly cuneate at base, then dilated to within 2 mm of the tip where it is about 4 mm wide and constricted. Beyond the constriction it is again dilated into a transversely oblong limb 7 mm wide. Disc bicarinate.

Flowers flesh-colored, the petals white, the lip with "yellow-purple" spots.

Mindoro.

37. **E. odorifera** Leavitt supra 223.

Aspect of *E. annulata* Bl. Internodes of the stem 2.5 to 3 cm long, 0.4 cm in diameter. Sheathing bases of the leaves rather sparsely hairy, the hairs long, red and divaricate. Leaf-blades sparingly hairy, lanceolate to oblanceolate, long acuminate, acute, up to 14 cm long and 1.5 wide. Inflorescence 2 cm long, few-flowered, the bracts about 6, suborbicular, acuminate, 8 mm long. Dorsal sepal oblong, acute, somewhat carinate, 8 mm long, 3 mm wide. Lateral sepals almost oblong, their greatest diameter parallel to the ovary, slightly falcate, somewhat carinate, acute, 12 mm long from the apex of the mentum to the tip of the sepal, the free limb 4 mm wide. Petals linear, slightly spathulate, obtuse, somewhat falcate, nearly equaling the dorsal sepal, 1.5–2 mm wide. Lip pubescent externally and internally, unguiculate, cuneate, 3-lobed near the apex; lateral lobes small, straight, oblong, rounded; middle lobe bilobulate, the lobules ovate or orbicular; sinus between the lateral lobes and the middle lobe triangular; entire lip 12 mm long (10 mm to the apices of the lateral lobes), 5 mm wide. Column including anther-cap and foot 1 cm long. (Fig. 24.)

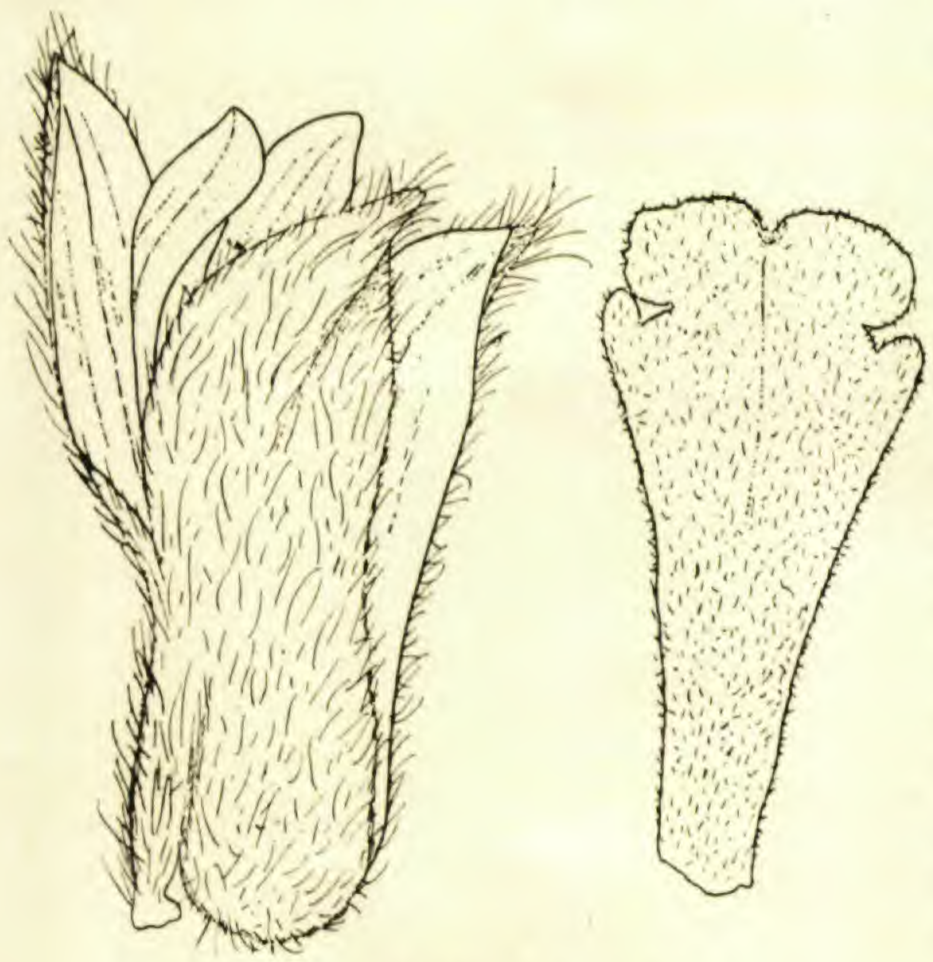

FIG. 24.—*Eria odorifera*, from the type.

Mindanao.

38. **E. halconensis** Ames in Philip. Journ. Sci. 2 (1907) Bot. 330; supra 224.

Plant up to 9 dm tall. Leaves linear-lanceolate, acuminate, acute, 1 dm long, up to 1 cm wide. Inflorescence 5 cm long, the bracts broadly ovate to suborbicular, 6 mm long, acuminate. Dorsal sepal oblong. Laterals triangular, acutish, 7 mm long, 4 mm wide at base. Petals linear to spathulate, tapering to the apex, 6 mm long, 1.5 mm wide. Lip

7 mm long, linear-cuneate at base, dilated above, constricted within 2 mm of the tip, 3–lobed; lateral lobes minute, obtuse; mid-lobe subquadrate, apiculate, 4 mm wide; disc with a prominent mid-nerve. Mentum about 3 mm long.

Flowers pink-purple.
Mindoro.

39. **E. Ramosii** Leavitt supra 224.

A dwarf creeping species, densely hirsute with yellow hairs. New members of the sympodium arising 3 to 4 cm from the bases of the old, the erect leafy portions up to 4 cm long. *Stem when dry less than 1 mm in diameter; internodes 7 mm long.* Persistent bases of the leaves somewhat funnelform; lamina elliptic, oblong, or broadly lanceolate, acuminate, 8 mm long, 3 mm wide. Flower solitary, sessile near the end of the stem. Dorsal sepal oblong, acuminate, 5 mm long, 2 mm wide. Laterals triangular, acute, 7 mm long, 6 mm wide at base. Petals externally pilose, oblong, acuminate, acute, 4–5 mm long, scarcely 2 mm wide. Lip entire, ovate, externally pilose, carinate on the back and apiculate, 6 mm long, 3.5 mm broad. Column thick and pilose. Pollinia 4. (Fig. 25.)

FIG. 25.—*Eria Ramosii,* from the type.

Flower purplish.
Luzon.

40. **E. cymbiformis** J. J. Smith Rec. Trav. Bot. Neerl. 1 (1904) 152; supra 224.

Stems up to 12 cm long, wholly concealed by the closely imbricated bases of the crowded leaves. *Leaves 10 or more, ensiform from a broad, sheathing base, up to 70 cm long and 2 cm wide.* Inflorescence 25 cm or more long, erect, with scattered short white tomentum; bracts narrow, 2 mm long; raceme cylindric, 2 cm in diameter. Ovary with pedicel 5 mm long, pubescent. Dorsal sepal obovate, 5 mm long, 3 mm broad, obtuse; laterals broadly and unsymmetrically ovate, 5 mm long, 7 mm broad, obtuse. Petals rhombic-obovate, 4 mm long, 3 mm wide, obtuse. *Lip saccate, truncate, acute-angled on the sides in front.* (Fig. 26.)

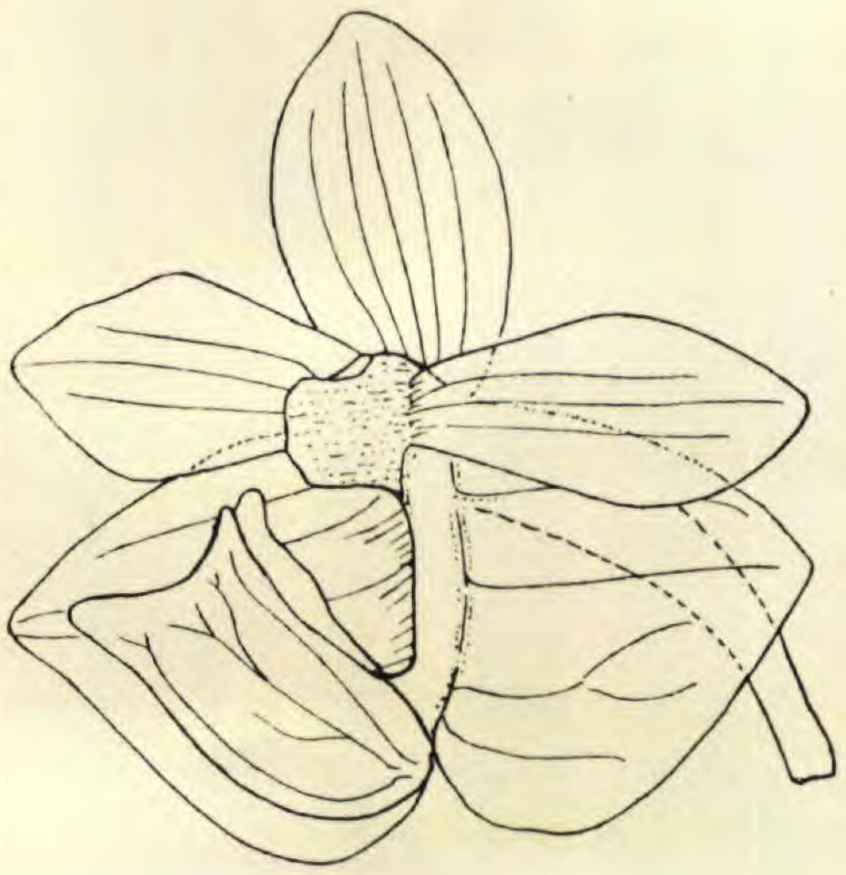

FIG. 26.—*Eria cymbiformis*

Flowers white.
Luzon, Mindoro: Sumatra.

LIST OF NEW SPECIES AND VARIETIES PROPOSED IN THIS PAPER.

Eria Copelandii Leavitt, 203; var. *fusiformis* Leavitt 204; *E. longicruris* Leavitt, 205; *E. racemosa* Leavitt, 206; *E. bractescens,* var. *latipetala* Leavitt, 210; *E. Curranii* Leavitt, 210; *E. ventricosa* Leavitt, 211; var. *benguetensis* Leavitt, 212; *E. Whitfordii* Leavitt, 215; *E. Mearnsii* Leavitt, 216; *E. anceps* Leavitt, 219; *E. longibracteata* Leavitt, 219; *E. Clemensiae* Leavitt, 220; *E. odorifera* Leavitt, 223; *E. Ramosii* Leavitt, 224.

The section of *Eria* heretofore often known as § *Mycaranthes* has above (217) been given the designation § **Secundae.**

ILLUSTRATIONS.

[All text figures.]

FIG. 1. *Eria Aëridostachya* Lindl., from Lindley's type.
2. *E. polyura* Lindl., from Lindley's type.
3. *E. Copelandii* Leavitt, from the type.
4. *E. Hutchinsoniana* Ames, from the type.
5. *E. philippinensis* Ames, from the type.
6. *E. longicruris* Leavitt, from the type.
7. *E. retroflexa* Lindley, from Lindley's type.
8. *E. ovata* Lindley, from Lindley's type.
9. *E. Elmeri* Ames, from the type.
10. *E. floribunda* Lindley, lip, from Lindley's type.
11. *E. bractescens* Lindley, lip, from Lindley's type.
12. *E. bractescens* var. *latipetala* Leavitt, lip, from the type.
13. *E. Curranii* Leavitt, lip, from the type.
14. *E. profusa* Lindl.
15. *E. cylindrostachya* Ames, lip and petal from the type.
16. *E. ventricosa* Leavitt, lip and petal from the type.
17. *E. Lyonii* Leavitt, from the type.
18. *E. anceps* Leavitt, from the type.
19. *E. longibracteata* Leavitt, from the type.
20. *E. Clemensiae* Leavitt, lip and petal from the type.
21. *E. gigantea* Ames, from the type, drawing by Ames.
22. *E. fastigatifolia* Ames, from the type, after Ames.
23. *E. vulpina* Reichb. f., lip.
24. *E. odorifera* Leavitt, from the type.
25. *E. Ramosii* Leavitt, from the type.
26. *E. cymbiformis* J. J. Smith.

NEW OR NOTEWORTHY PHILIPPINE PLANTS, VII.

By E. D. MERRILL.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

The present contribution is, like the preceding papers of the series, composed of miscellaneous diagnoses of apparently previously undescribed species in various families, and records of various species previously described and now found for the first time in the Philippines. A number of nomenclatural changes are included, in accordance with the rules of priority, and notes are added on some previously obscure or little-known species. Four genera, *Embolanthera, Everettiodendron, Greeniopsis,* and *Ahernia* are proposed as new, while the representatives of no less than twenty-one genera, previously unrecorded from the Philippines are enumerated, *Boottia, Anacolosa, Illicium, Erythrophloeum, Kingiodendron, Azadirachta, Heynea, Blachia, Galearia, Microdesmis, Ostodes, Strophioblachia, Pleiogynium, Leptonychia, Trichadenia, Ochrosia, Willoughbya, Coptosapelta, Damnacanthus, Greenea,* and *Litosanthes.* Twenty-five species previously described by various authors from extra-Philippine material are here recorded from the Archipelago for the first time, while eighty-five species are described as new. On account of the rule adopted by the Vienna Botanical Congress, requiring Latin diagnoses of all species proposed after January 1, 1908, short diagnoses have been added, and in cases where it has been necessary to consider species proposed since that date, but which were without the required diagnosis, this has been added.

ALISMACEÆ.

BOOTTIA Wallich.

Boottia renifolia sp. nov.

Planta aquatica, glabra; foliis reniformibus, longe petiolatis, apice late rotundatis, basi cordatis, circiter 8 cm latis, nervis 7 ad 9; spathis unisexualibus, tubulosis; floribus masculinis vulgo binis, exsertis, antheris 9, pistilli rudimentiis pulviformibus; floribus femineis circiter 2.5 cm diametro, solitariis, pedicellatis; stylis 6, bifidis; staminodiis 9 quorum 6 linearibus, 3 capitatis.

An aquatic glabrous plant. Leaves tufted, their petioles 10 to 25 cm long, the blades reniform, 4.5 to 6 cm long, about 8 cm wide, papyraceous, the apex broadly rounded, the base cordate; primary nerves 7 to 9, the cross reticulations lax, indistinct. Male flowers one, or commonly two, from tubular, linear spathes which are very slightly cleft at the apex and not keeled or ribbed, exserted in anthesis, the pedicels very slender; sepals and petals as in the pistillate flowers; stamens 9, the filaments flattened, 1.5 to 2 mm long; anthers basifixed, oblong, 1.5 mm long; rudimentary pistil represented by a sessile, 1.5 mm long, cushion-like body, the styles none. Pistillate flowers white, solitary, their pedicels 5 cm long or less; sepals 3, elliptic-oblong, about 7 mm long, 3.5 to 4 mm wide, about 12-nerved; petals obovate, 12 mm long; styles 6, cleft two-thirds to the base, the arms glandular-hairy; staminodes of two kinds, 6 linear, 2.5 to 3 mm long, and 3 subsessile, capitate, 1 mm in diameter. Ovary several-celled, cylindric, smooth. Fruit unknown.

LUZON, Province of Camarines, Bicol River, Bula, *For. Bur. 12274 Curran*, June 5, 1908.

An interesting addition to our knowledge of the Philippine flora, the first representative of the genus to be found in the Philippines. It is allied to *Boottia cordata* Wall., of British India, but differs in many characters, notably in its reniform leaves, linear, tubular spathes which contain but one or two flowers, the staminate flowers without rudimentary styles, and the pistillate flowers with two kinds of staminodes, six linear and three capitate. The genus contains about 15 species, in tropical Africa and Asia.

GRAMINEÆ.

PANICUM Linn.

Panicum malabaricum (Linn.) comb. nov.

Poa malabarica Linn. Sp. Pl. (1753) 69.

Panicum arnottianum Nees in Steud. Syn. Pl. Gram. (1854) 59.

Panicum nodosum Hook. f. Fl. Brit. Ind. **7** (1897) 43, excl. syn., non Kunth.

Hooker f.[1] referred *Poa malabarica* Linn. to *Centotheca lappacea* (Linn.) Desv., but gave no reason for this. Considering that he was correct I transferred the name to *Centotheca* as *C. malabarica* (Linn.) Merr. It seems, however, that Hooker f. was in error in citing *Poa malabarica* Linn. as a synonym of *Centotheca lappacea*. Munro in his paper on the grasses of the Linnean herbarium states regarding *Poa malabarica* "*P(oa) malabarica* is *Panicum arnottianum* Nees. The reference to Rheede is correct; it is a very fair drawing."[2] Linnaeus' species is manifestly based on Tsjama-pullu of Rheede, Hortus Malabaricus **12**:83, *t. 45*. Through the kindness of Mrs. Agnes Chase of the United States Department of Agriculture, I have received a tracing of the above plate, and although the plate is crude, it seems to be well matched by several specimens in our herbarium determined as *Panicum nodosum* Kunth. Three specimens from Singapore, collected by Ridley resemble it very closely.

[1] Fl. Brit. Ind. **7** (1897) 332. [2] Journ. Linn. Soc. Bot. **6** (1862) 43.

Panicum nodosum Kunth, which is closely allied, differs mainly in being much smaller, with shorter, narrower leaves, and much smaller panicles. The type of Kunth's species was from the Philippines, *P. nodosum* being based on *P. multinode* Presl, non Lam. Balansa, apparently assuming the Indian form to be typical *Panicum nodosum* Kunth, has distinguished the smaller form, apparently typical *P. nodosum* Kunth, as *P. ouonbiense.*

I am disposed to refer to *Panicum malabaricum* (Linn.) Merr., two specimens from the Philippines, Palmas Island, *Merrill 5367*, and *For. Bur. 5349 Merritt*, from Mindoro. The former was previously referred by me to *P. nodosum* Kunth.

In a broad sense *Panicum malabaricum* might include *P. nodosum* Kunth, but I am disposed to consider the small form described by Kunth as worthy of specific rank.

Panicum cordatum Büse in Miq. Pl. Jungh. (1854) 376.

P. luxurians Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 359, cum syn., non Willd.

LUZON, Province of Union, Bauang, *Elmer 5595:* Province of Bataan, Lamao River, *Williams 134, Elmer 6735:* Province of Bulacan, Norzagaray, *Yoder 1, 163.* CULION, *Merrill 554.*

This species was previously determined by me as *Panicum luxurians* Willd., but is apparently not that species. I have examined the material in the Willdenow Herbarium so named, there being two specimens, one marked "Klein Ind. 1799" which is apparently a form of *Panicum prostratum* Lam.=*P. reptans* Linn., the other from St. Vincent, collected by Bory, which may be the same as *P. caespitosum* Sw. Willdenow, Enum. 1 (1833) 109, gives as the only locality for the species "Luzonia," an apparent error on his part.

The specimens cited above closely resemble *Panicum montanum* Roxb., but can be readily distinguished from that species by the first glume being as long as the spikelet. The Philippine material differs from Javan *cordatum* in its relatively narrower and less prominently cordate leaves, but does not seem to be specifically distinct from that species.

Panicum reptans Linn. Syst. Nat. ed. 10, 2 (1759) 871; Hitchc. in Contr. U. S. Nat. Herb. 12 (1908) 119.

Panicum prostratum Lam., Ill. 1 (1791) 171; Kunth Enum. 1 (1833) 89; Steud. Syn. 1 (1854) 61; Hook. f. Fl. Brit. Ind. 7 (1897) 33; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 355.

The oldest name for this common and widely distributed species is *Panicum reptans* Linn., as shown by A. S. Hitchcock l. c., who has examined the type in the Linnean herbarium.

Panicum paludosum Roxb. Hort. Beng. (1814) 6, *nomen;* Fl. Ind. 1 (1820) 307.

Panicum proliferum Hook. f. Fl. Brit. Ind. 7 (1897) 50; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 359, non Lam.

Mr. A. S. Hitchcock has examined the type of Lamarck's *Panicum proliferum* in the Paris Herbarium, and finds it to be identical with *Panicum miliare* Lam.,[3] and has accepted *P. dichotomiflorum* Michx. as the earliest valid name for the species, commonly identified by American authors as *P. prostratum* Lam. I am now of the opinion that the species of tropical Asia and Malaya is distinct from the American form, and have here adopted Roxburgh's specific name for the oriental form, as it seems to be the earliest valid one.

[3] Contr. U. S. Nat. Herb. 12 (1908) 147.

NEYRAUDIA Hook. f.

NEYRAUDIA MADAGASCARENSIS (Kunth) Hook. f.; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 381.

This species was admitted on the strength of identifications made by Vidal, and Ceron, based on *Cuming 623*, and *Vidal 4017*. I have examined both in the Kew Herbarium, and find them to be referable to *Phragmites karka* (Retz.) Trin. *Neyraudia madagascarensis* must therefore be excluded from the Philippine flora.

ANDROPOGON Linn.

Andropogon leptos Steud. Syn. 1 (1855) 397; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 337.

Garnotiella philippinensis Stapf in Hook. Ic. Pl. IV 5 (1896) *pl. 2494;* Merr. l. c. 374.

Here enumerated to all attention to the reduction of the monotypic genus *Garnotiella.* The type of *Garnotiella philippinensis* in the Kew Herbarium, is identical with *Andropogon leptos*, and is a true *Andropogon.* Dr. Stapf, to whose attention I called the matter, concurs in this reduction. To be sure of the identity of the Philippine plant with *Andropogon leptos* Steud., I later examined the type of Steudel's species in the Berlin Herbarium, and found the determination to be correct.

CYPERACEÆ.

FIMBRISTYLIS Vahl.

FIMBRISTYLIS CYMOSA R. Br.; Clarke in Philip. Journ. Sci. 2 (1907) Bot. 97.

This species must be excluded from the Philippine flora, as the specimen in the Kew Herbarium, on which the record was based, bears a printed label with the date 1831, and is from Cuming's first collection from the southern Pacific, and not from the Philippines. Cuming's Philippine plants were distributed ten years later.

BURMANNIACEÆ.

BURMANNIA Linn.

B. coelestis D. Don Prodr. Fl. Nepal. (1802–03) 44; Ridley Materials Fl. Malay. Penin. 2 (1907) 71.

B. azurea Griff. Notul. 3 (1851) 236; Ic. Pl. As. *t. 272, f. 1;* Becc. Malesia 2 (1878) 242, *t. 15, f. 1–3.*

LUZON, Province of Pangasinan, Infanta, *Bur. Sci. 4913 Ramos,* December, 1907.

The fourth species of the genus to be found in the Philippines. Widely distributed from India to the Malay Peninsula, Borneo, Labuan and the Caroline Islands.

FAGACEÆ.

QUERCUS Linn.

Quercus obliquinervia sp. nov. § *Cyclobalanus.*

Arbor 20 m alta, cupulis exceptis glabra; ramis ramulisque griseis; foliis oblongo-lanceolatis vel late lanceolatis, integris, crasse coriaceis, usque ad 11 cm longis, valde acuminatis, nervis utrinque 8, valde obliquis, reticulis obscuris; cupulis 2 cm diametro, intus glabris, extus pubescen-

tibus; glandibus oblongo-ovoideis, 2.3 cm longis apice rotundatis, breviter apiculatis.

A tree about 20 m high, glabrous throughout, except the cups (inflorescence unknown), branches terete, lenticellate, light-gray. Leaves thickly coriaceous, oblong-lanceolate or broadly lanceolate, 7 to 11 cm long, 2.5 to 4 cm wide, entire, the apex strongly acuminate, acumen blunt, often slightly falcate, base decurrent-acuminate, both surfaces shining, the lower slightly paler than the upper; nerves 8 on each side of the midrib, oblique, rather distinct beneath, nearly straight, more or less curved near the margins, not anastomosing, the reticulations fine, indistinct; petioles 1.5 to 2 cm long. Flowers unknown. Cup including the stout stipe 1.5 cm high, inclosing only about the lower one-fourth of the glans, 2 cm in diameter, glabrous and shining inside, outside cinereous-pubescent, lamellae about 5 the lower ones distant, the upper close, denticulate. Glans oblong-ovoid, 2.3 cm long, about 1.8 cm in diameter, glabrous, apex rounded, apiculate.

LUZON, Province of Benguet, Pauai, *For. Bur. 18380 Alvarez*, January, 1909: Province of Abra, *For. Bur. 14605 Darling*, February, 1909, altitude 1,400 to 2,000 m. in forests; known in Benguet as *Ticlick*, and in Abra as *Bultioc*.

A species well characterized by its very obliquely nerved leaves, probably most closely allied to *Quercus merrittii* Merr., among the Philippine forms, but very different from that.

ULMACEÆ.

GIRONNIERA Gaudich.

Gironniera curranii sp. nov.

Arbor circiter 15 m alta, glabra; foliis ovato-lanceolatis vel elliptico-lanceolatis, glabris, nitidis, 8 ad 12 cm longis, basi rotundatis, apice caudato-acuminatis, margine integris vel superne pauce irregulariter serratis; nervis utrinque 13 ad 15, prominentibus; floribus femineis axillaribus, solitariis, longe pedicellatis, 5-meris.

A tree about 15 m high, glabrous throughout. Branches slender, terete, gray or brownish, the branchlets somewhat angled, sometimes with very few appressed hairs. Leaves ovate-lanceolate to elliptic-lanceolate, subcoriaceous, shining, 8 to 12 cm long, 3.5 to 5 cm wide, paler beneath, the base rounded, the apex caudate-acuminate, the acumen 2 cm long or less, 3 to 4 mm wide, abruptly acute or apiculate, margins entire, or with few prominent, irregular teeth at the apex just below the acumen; nerves 13 to 15 on each side of the midrib, prominent, curved-ascending; petioles 6 to 8 mm long. Pistillate flowers axillary, solitary, the calyx lobes (in fruit) 5, ovate, acute or obtuse, about 2 mm long, the margins somewhat ciliate, the fruit (immature) ovoid or elliptic-ovoid, 1.3 cm long, 9 mm thick, glabrous, shining; style arms 2, stout, about 3 mm long; pedicels about 1.5 cm long, slender.

LUZON, Province of Camarines, Mount Isarog, *For. Bur. 10498 Curran*, May 25, 1908, in forests on the lower slopes at an altitude of about 100 m.

A species well characterized by being glabrous throughout, and its smooth shining leaves which are entire or with but few irregular teeth at the apex only.

MORACEÆ.

FICUS Linn.

Ficus merrittii sp. nov. § *Covellia.*

Arbor usque ad 12 m alta, ramulis petiolis, foliis subtus et inflorescentiis plus minus ferrugineo-hirsutis; foliis obovato-oblongis vel obovatis, chartaceis, 18 ad 25 cm longis, integris vel obscure dentatis, apice breviter acuminatis, basi inaequilateraliter cordatis; nervis utrinque 8 ad 10, prominentibus; stipulis caducis, lanceolatis, acuminatis, brunneis, 2.5 ad 3 cm longis; inflorescentiis caulinis, 10 ad 25 cm longis, ramosis, plus minus ferrugineo-hirsutis; receptaculis obovoideis, 1.5 ad 2 cm longis, plus minus ferrugineo-hirsutis, basi 3–bracteolatis; pedunculis hirsutis, usque ad 2 cm longis; ovario oblongo-ovoideo; perigonibus nullis.

. A tree 12 m high or less. Branches reddish-brown, terete, more or less ferruginous-hirsute. Leaves opposite, obovate to oblong-obovate, 18 to 25 cm long, 9 to 13 cm wide, chartaceous, somewhat shining, the midrib and nerves on both surfaces with few or many, long, pale or ferruginous hairs, the upper surface ultimately glabrous, margins entire or obscurely dentate, the apex shortly and abruptly acuminate, somewhat narrowed below to the slightly inequilateral and cordate base; the lower surface minutely punctate; nerves 8 to 10 on each side of the midrib, prominent, anastomosing, the reticulations lax, distinct; petioles ferruginous-hirsute, 6 cm long or less; stipules caducous, lanceolate, acuminate, brown, ferruginous-hirsute at the base only, otherwise glabrous, 2.5 to 3 cm long. Inflorescence from the trunk, few or many branched, 10 to 25 cm long, reddish-brown, more or less ferrugineous-hirsute at the nodes and on the bracts and bracteoles, the bracts ovate, acuminate, 8 mm long or less, deciduous. Receptacles usually at the ends of the branchlets, few or many, obovoid, 1.5 to 2 cm long, brown, purplish or greenish, with few or many pale or ferruginous hairs, the base with three small narrowly-ovate bracteoles 2 to 3 mm long; peduncles more or less ferruginous-hirsute, 2 cm long or less. Staminate flowers not seen. Fertile female flowers pedicellate, glabrous, the ovaries ovoid to oblong-ovoid, about 1.5 mm long; styles slender, about 2 mm long. Perianth none, or present in very young flowers as minute scales.

MINDORO, *For. Bur. 11466 Merritt*, May, 1908 (type). Also represented by the two following specimens from the same Island *For. Bur. 6852, 11477 Merritt*, April, 1907 and May, 1908. N. v., *Tibig.*

A species closely allied to *Ficus nota* (Blanco) Merr., differing especially in the long ferruginous hairs on the leaves, petioles, inflorescence and receptacles.

SANTALACEÆ.

EXOCARPUS Lab.

Exocarpus rolfeanus (O. Kuntze) comb. nov.

Xylophyllos rolfeana O. Kuntze Rev. Gen. Pl. 1 (1891) 589, (*rolfsiana*).

PALAWAN, *Vidal 3647*, type in Herb. Kew.; Victoria Peak, *For. Bur. 3852 Curran*, March, 1906, altitude 300 m.

A curious endemic species, known only from the above two collections. Curran's specimen is sterile, and is described by him as a 3 m high shrub.

OLACACEÆ.

ANACOLOSA Blume.

Anacolosa luzoniensis sp. nov.

Arbor glabra, inflorescentiis exceptis, usque ad 15 m alta; foliis chartaceis vel subcoriaceis, ovato-oblongis, elliptico-oblongis, vel oblongis, 8 ad 12 cm longis, basi acutis, apice obtusis vel obscure acuminatis, nervis utrinque circiter 5; floribus axillaribus, congestis, griseo-puberulis, stipitatis, 6-meris; petalis intus in partibus infericribus glabris, carinatis, supra crassis, subtrigonis, dense pubescentibus; filamentis latis, glabris, connectivo indumento denso coronato; ovario 2-loculare; fructibus ellipsoideis, 2 cm longis, disco accrescenti.

A tree reaching a height of 15 m, glabrous except the inflorescence. Branches slender, terete, reddish-brown. Leaves alternate, oblong, ovate-oblong, or elliptic-oblong, 8 to 12 cm long, 3 to 5 cm wide, chartaceous to subcoriaceous, dark or pale when dry, sligtly shining, the base acute, the apex obtuse, rarely obscurely and broadly acuminate; nerves about 5 on each side of the midrib, anastomosing, the reticulations lax; petioles 5 to 8 mm long. Flowers pale-green, gray-puberulent, densely congested, axillary, the stipes 2 to 3 mm long. Calyx 3 mm in diameter, subtruncate and with 6 minute teeth. Petals 6, valvate, pubescent, lanceolate or oblong-lanceolate, 4 mm long, 1.8 mm wide, acute or somewhat acuminate, the lower half, inside, glabrous and keeled, the upper portion thickened, 3-sided, and densely pubescent in the central portion. Stamens 6, opposite the petals; filaments broad, about 1 mm long and broad, flattened, glabrous, the antheriferous portion as broad as the filament and crowned with copious hairs. Ovary superior, 2-celled, each cell with a single pendulous ovule; style narrowly conical, 1 to 1.5 mm long. Fruit fleshy, ellipsoid, about 2 cm long, 1-celled, entirely inclosed in the accrescent disk.

LUZON, Province of Bataan, Mount Mariveles, *For. Bur. 2830 Meyer*, March, 1905 (type), *For. Bur. 1199 Borden*, June, 1904, *For. Bur. 7222 Curran*, June, 1907, *Bur. Sci. 5165 Ramos*, February, 1908. MINDORO, *For. Bur. 8650, 11363 Merritt*, January, April, 1908. MASBATE, *For. Bur. 12601 Rosenbluth*, January, 1909.

The first representative of the genus to be found in the Philippines and apparently distinct from the few other species of the genus. On Mount Mariveles it is found at altitudes of from 700 to 850 m, but in Mindoro it occurs at lower elevations.

MAGNOLIACEÆ.

ILLICIUM Linn.

Illicium philippinense sp. nov.

Arbor parva vel arbuscula, glabra; foliis congestis, alternis vel subverticillatis, coriaceis, integris, acuminatis, oblongo-ellipticis vel elliptico-lanceolatis, 5 ad 8 cm longis, nervis lateralibus obsoletis; floribus axillaribus, solitariis, albis; staminibus circiter 15; carpellis circiter 8, 3 mm longis.

A small tree or a shrub 4 m high or less, glabrous. Branches rather stout, dark-colored, wrinkled when dry, the branchlets somewhat olivaceous. Leaves crowded near the tips of the branchlets, alternate, subverticillate, coriaceous, oblong-elliptic or elliptic-lanceolate, 5 to 8 cm long, 1.5 to 3.5 cm wide, coriaceous, the upper surface shining, the lower dull, acuminate at both ends; lateral nerves obsolete, the midrib prominent; petioles 5 to 10 mm long. Flowers solitary, axillary, white, fragrant, about 1 cm long. Sepals four or five, elliptic-oblong, 10 mm long, 5.5 mm wide, obtuse, nerved. Petals 2-seriate, the inner ones narrower than the outer, as long as the sepals but much narrower, narrowly oblong, obtuse, 2.5 to 3 mm wide. Stamens about 15; filaments stout, swollen, 2 mm long; anthers about 1 mm long. Carpels about 8, glabrous, 3 mm long including the recurved style. Mature fruit about 2 cm in diameter, consisting of from 5 to 8 carpels which are narrowly ovate, rostrate, wrinkled when dry. Seed pale, shining.

LUZON, Province of Zambales, Mount Tapulao, *For. Bur. 9515 Curran & Merritt* (type); *Bur. Sci. 5078 Ramos*, December, 1907, on exposed mountain top in the elfinwood, altitude about 2,100 m. MINDORO, Mount Halcon, *For. Bur. 4411 Merritt*, June, 1906.

The only representative of the genus known from the Philippines, apparently well characterized by its small leaves which are without evident lateral nerves. It has previously been recorded by me from Mindoro as *Illicium* sp.[4] It is probably most closely allied to *I. evenium* King, of the Malay Peninsula.

LAURACEÆ.

CRYPTOCARYA R. Br.

Cryptocarya lauriflora (Blanco) comb. nov.

Salgada lauriflora Blanco Fl. Filip. ed. 2 (1845) 221, ed. 3, **2**:50; Merr. in Govt. Lab. Publ. (Philip.) **27** (1905) 73.

Eusideroxylon borneense F.-Vill. Nov. App. (1883) 179, non T. & B.

Cryptocarya luzoniensis Vidal Rev. Pl. Vasc. Filip. (1886) 222; Ceron Cat. Pl. Herb. (Manila) (1892) 141; Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 58.

[4] Philip. Journ. Sci. **2** (1907) Bot. 272.

LUZON, Province of Rizal, Cardona, Vidal 1680 (type, of *C. luzoniensis*, in Herb. Kew.); Antipolo and Bosoboso, *For. Bur. 401, 2663 Ahern's collector*, February, 1904, and January, 1905: Province of Pampanga, Mount Arayat, *Vidal 1686*, in Herb. Kew.: Province of Bataan, Mount Mariveles *Whitford 1050, 1043*, January, 1905, December, 1904, *For. Bur. 6264, 6274, 7372 Curran*, February and July, 1907: Province of Camarines, Pasacao, *Ahern 32, 183*, January, February, 1902. MINDORO, *For. Bur. 8609 Merritt*, January, 1908.

Blanco's monotypic genus *Salgada*, has not previously been satisfactorily identified, although it was referred by Fernandez-Villar[5] without question and without discussion, to the Bornean genus *Eusideroxylon* Teysm. & Binn., but a cursory examination of Blanco's description shows at once that his species can not be referred to *Eusideroxylon*. It does, however, apply closely to *Cryptocarya*, and morover his specific description applies to *Cryptocarya luzoniensis* Vidal. I have accordingly here reduced *Salgada* to *Cryptocarya*, and in making this reduction, have adopted the earliest specific name for the species, reducing Vidal's *Cryptocarya luzoniensis*. Blanco's description very clearly states that his genus has nine fertile stamens, of which the outer six have introrse anthers, and the inner three have extrorse ones; moreover he describes the anthers as 1-celled, his expression "cuerpecillos laterales" certainly applying to the valves of the anther-cells. Blanco describes the ovary as inferior, probably because it is immersed in the calyx-tube, and later states that the fruit is inferior, the latter being apparently an error in his description, or due to a mixture of material. There seems to be absolutely no doubt as to the identity of *Salgada* with *Cryptocarya*, in spite of the above discrepancies in Blanco's description.

Cryptocarya bicolor sp. nov.

Arbor circiter 25 m alta; foliis alternis, elliptico-oblongis vel late oblongo-lanceolatis, subcoriaceis, supra glabris, nitidis, subtus albo-glaucescentibus, 10 ad 20 cm longis, usque ad 7 cm latis, apice breviter obtuseque acuminatis, basi acutis; nervis utrinque circiter 10, subtus prominentibus, ferrugineo-pubescentibus, tenuiter anastomosantibus, reticulis densis, obscuris; paniculis pubescentibus, axillaribus terminalibusque, quam folia brevioribus; floribus sessilibus vel breviter pedicellatis, circiter 3 mm longis.

A tree about 25 m high, more or less pubescent. Branches slender, brown, terete, somewhat pubescent, the young branchlets rather densely pubescent. Leaves alternate, elliptic-oblong or broadly oblong-lanceolate, 10 to 20 cm long, 4 to 7 cm wide, subcoriaceous, the apex shortly acuminate, the acumen obtuse, the base acute, the upper surface glabrous, shining, somewhat olivaceous, the midrib sometimes pubescent, the lower surface very pale, glaucous, nearly white, sparingly pubescent, the midrib and lateral nerves ferruginous; nerves about 10 on each side of the midrib, obscure on the upper surface, very distinct on the lower, slightly curved, spreading-ascending, attenuate and obscurely anastomosing near the margins, the reticulations rather dense, not distinct; petioles pubescent, about 8 mm long. Panicles axillary and terminal, 10 cm long or less, pubescent, many-flowered, somewhat diffuse. Flowers yellow, fragrant,

[5] Nov. App. (1880) 179.

about 3 mm long, sessile or short pedicellate, the bracteoles small. Calyx-tube about 1.5 mm long, pubescent, cylindric; perianth-lobes pubescent on the outside, subequal, oblong, about 2 mm long, acute or blunt. Stamens as in other species of the genus, the filaments short, glabrous. Staminodes 1.5 mm long, stipitate, acuminate. Fruit unknown.

MINDANAO, District of Zamboanga (?), *For. Bur. 6548 Hutchinson*, March, 1907. N. v., *Ducatan, Masagcunadug*.

A species well characterized by its leaves which are shining and glabrous above, and nearly white beneath, the midrib and lateral veins ferruginous, the reticulations not distinct, and its panicles which are about one-half as long as the leaves. The timber is used for house-posts.

Cryptocarya palawanensis sp. nov.

Arbuscula circiter 3 m alta; foliis chartaceis, oblongis, usque ad 35 cm longis, 10 cm latis, apice acuminatis, basi acutis, utrinque glabris, costa nervisque exceptis; nervis utrinque circiter 15; paniculis axillaribus, foliis multo brevioribus, pubescentibus; perianthiis segmentis subaequalibus, pubescentibus, 2.5 mm longis; fructibus ovoideis, 1.5 cm longis, nigris, nitidis, glabris.

A shrub about 3 m high. Branchlets ferruginous-pubescent. Leaves chartaceous, oblong, up to 35 cm long, 10 cm wide, the apex rather strongly acuminate, the base acute, somewhat shining and glabrous on both surfaces except the midrib and lateral nerves which are somewhat pubescent, the upper surface olivaceous, the lower brownish; nerves about 15 on each side of the midrib, beneath very distinct, obscurely anastomosing, the primary reticulations lax, the ultimate ones dense; petioles pubescent, about 1 cm long. Panicles axillary, pubescent, 8 to 10 cm long, the branches 3 cm long or less. Flowers pedicellate or sessile, pubescent, the tube cylindric, quickly inflated, somewhat longitudinally striate, the perianth-lobes 6, subequal, pubescent, 2.5 mm long. Fruit ovoid, black, shining, glabrous, 1.3 cm long.

PALAWAN, near the Iwahig Penal Settlement, *For. Bur. 4141 Curran*, April, 1906, along the banks of tidal streams.

A species characterized by its rather large leaves and comparatively short panicles.

Cryptocarya pallida sp. nov.

Arbor vel arbuscula; ramis teretibus nigricantibus, glabris, ramulis plus minus pubescentibus; foliis ovatis vel elliptico-ovatis, chartaceis, 8 ad 11 cm longis, 3 ad 5 cm latis, apice acuminatis, basi acutis vel rotundatis, supra olivaceis, glabris, nitidis, subtus subalbidis, parce pubescentibus, costa nervis reticulisque brunneis; paniculis axillaribus, plus minus pubescentibus; fructibus ellipsoideis, 2.5 cm longis, 1.5 cm diametro, glabris, nitidis, utrinque apiculatis.

A shrub or tree, nearly glabrous. Branches terete, dark-colored, glabrous, the branchlets somewhat pubescent. Leaves alternate, chartaceous, ovate to elliptic-ovate, 8 to 11 cm long, 3 to 5 cm wide, the apex rather

sharply acuminate, the base acute or rounded, the upper surface olivaceous, glabrous, shining, the lower surface nearly white, slightly pubescent, the midrib nerves and primary reticulations brown; nerves 5 on each side of the midrib, distinct beneath, anastomosing, the reticulations lax; petioles about 5 mm long, slightly pubescent. Panicles axillary, in fruit 10 cm long or less, slightly pubescent. Flowers unknown. Fruits ellipsoid about 1.5 cm in diameter, 2.5 cm long, dark-colored, glabrous, shining, apiculate at both ends, obscurely longitudinally striate.

MINDANAO, District of Zamboanga, Tetuan, *Ahern 594, 566,* February to June, 1901, N. v., *Ponit.*

Characterized by its relatively large fruits which are apiculate at both ends, and by its leaves which are nearly white beneath.

Cryptocarya everettii sp. nov.

Arbor, 10 ad 18 m alta; foliis alternis, oblongo-ellipticis, ellipticis, vel oblongo-lanceolatis, subcoriaceis, 10 ad 20 cm longis, acuminatis, supra nitidis, glabris, brunneis, subtus glaucescentibus, valde pulcherrime reticulato-venosis; paniculis pubescentibus, 8 ad 10 cm longis, axillaribus terminalibusque; floribus albis, circiter 4 mm longis, pedicellatis vel subsessilibus; fructibus oblongis, glabris, circiter 3 cm longis.

A tree 10 to 18 m high, nearly glabrous throughout except the inflorescence. Branches slender, light-gray, glabrous, the young branchlets somewhat pubescent. Leaves alternate, oblong-elliptic, elliptic or oblong-lanceolate, 10 to 20 cm long, 4 to 7 cm, rarely 9 cm wide, subcoriaceous, the upper surface glabrous, or sometimes slightly pubescent along the midrib, shining, brown, the lower surface glaucous, the nerves and reticulations prominent, brown, slightly pubescent, the apex abruptly and sharply acuminate, the base acute; nerves about 10 on each side of the midrib, beneath very prominent, anastomosing, the reticulations rather lax, very distinct, the brown midrib, nerves and reticulations in strong contrast to the glaucous under surface of the leaf; petioles 5 to 10 mm long, somewhat pubescent. Panicles axillary and terminal, 8 to 10 cm long, pubescent, the flowers white, pedicellate or subsessile, about 4 mm long, the bracteoles deciduous, about 2.5 mm long. Calyx-tube densely pubescent, 2 mm long, the perianth segments subequal, 2.5 mm long, elliptic-ovate, obtuse, pubescent. Fertile stamens 9, the filaments somewhat pubescent, the anthers of the outer two series introrse, those of the inner series extrorse; staminodes ovate, short-stipitate, somewhat pubescent, acute. Ovary narrowly oblong, glabrous; style 1.5 mm long. Fruit black when dry, glabrous, smooth, oblong or narrowly oblong, about 3 cm long, 1 cm thick, narrowed upwards, not striate.

NEGROS, *For. Bur. 4236, 4311, 7288, 7311 Everett,* April–June, 1906–07, *For. Bur. 7409 Danao,* June, 1907, *Whitford 1614,* May, 1906.

A species common in the dipterocarp forests in northern Negros, well characterized by its leaves being glaucous beneath, and strongly reticulate, the midrib, nerves, and reticulations on the lower surface of the leaf being brown, in sharp contrast to the glacous surface. V., *Balit, Putian.*

Cryptocarya ampla sp. nov.

Arbor alta, inflorescentiis exceptis glabra; foliis oblongis, coriaceis, nitidis, 18 ad 25 cm longis, 5 ad 9 cm latis, apice late acuminatis, basi cuneatis vel rotundatis, concoloribus vel subtus brunneis; nervis utrinque 8 ad 10, prominentibus, obscure anastomosantibus, reticulis validis, densis; paniculis axillaribus terminalibusque, foliis subaequalibus, pubescentibus; floribus numerosis, pedicellatis, 4 mm longis; fructibus ellipsoideis vel obovoideis, parce pubescentibus, longitudinaliter striatis, circiter 12 mm longis.

A tall tree, glabrous throughout except the infloresence. Branches terete, lenticellate, brownish. Leaves alternate, oblong, 18 to 25 cm long, 5 to 9 cm wide, coriaceous, shining, the apex rather broadly acuminate, the base acute or rounded, about the same color on both surfaces; nerves 8 to 10 on each side of the midrib, rather prominent, curved-ascending, obscurely anastomosing, the reticulations beneath dense, distinct; petioles 1 to 1.5 cm long. Panicles axillary and terminal, about as long as the leaves, many flowered, the rachis and branches somewhat pubescent. Flowers white, 4 mm long, pedicellate, the pedicels pubescent, 1 to 2 mm long, with three small bracteoles at the apex. Calyx-tube cylindric, sulcate, pubescent, 1.5 to 2 mm long, the perianth-lobes 6, subequal, pubescent, oblong-obovate, acute or obtuse, 2 mm long. Fertile stamens 9; anthers all 2-celled, those of the two outer series introrse, those of the inner series extrorse, the filaments short; staminodes acuminate, about 1 mm long. Style 1 mm long. Fruit ellipsoid or obovoid, obtuse, somewhat narrowed at both ends, slightly pubescent, longitudinally striate, about 12 mm long.

LUZON, Province of Rizal, Antipolo and Montalban, *For Bur. 463, 397, 2438 Ahern's collector*, February and April, 1904, and January, 1905. T., *Bagarilao.*

A species well characterized by its large leaves and panicles.

Cryptocarya glauca sp. nov.

Arbor; foliis alternis, coriaceis, oblongo-ovatis vel elliptico-lanceolatis, usque ad 13 cm longis, 5 cm latis, supra brunneis, glabris, nitidis, subtus plus minus pubescentibus, glaucis; nervis subtus prominentibus, brunneis, circiter 8 utrinque; paniculis axillaribus terminalibusque, ferrugineo-pubescentibus, foliis aequalibus vel longioribus vel interdum brevioribus.

A tree, more or less pubescent. Branches terete, reddish-brown glabrous, lenticellate, the branchlets ferruginous-pubescent. Leaves alternate, coriaceous, oblong-ovate or elliptic-lanceolate, the apex shortly and obtusely acuminate, the base acute, 7 to 13 cm long, 2 to 5 cm wide, the upper surface dark- or pale-brown, glabrous, shining, the lower surface glaucous, somewhat ferruginous-pubescent, ultimately glabrous or nearly so; nerves prominent on the lower surface, brown, about 8 on each side of the midrib, obscurely anastomosing, the reticulations not very distinct, rather lax; petioles pubescent, 1 to 1.5 cm long. Panicles axillary and

terminal, ferruginous-pubescent, about as long as the leaves, sometimes longer, sometimes shorter. Flowers subsessile or shortly pedicellate, pubescent, 3 to 3.5 mm long, the bracteoles small, pubescent. Calyx-tube cylindric, 1.5 mm long. Perianth-lobes 6, equal, pubescent outside, elliptic-ovate, obtuse or acute, 2 to 2.5 mm long, 1 to 1.3 mm wide. Stamens as in other species of the genus.

LUZON, Province of Rizal, Bosoboso, *For. Bur. 2981 Ahern's collector*, April, 1905 (type). Apparently the same species, but with small panicles, is represented by *Merrill 2337*, from Tanay, the same Province.

Allied to *Cryptocarya lauriflora* (Blanco) Merr., but differing in many characters, notably in its leaves being very glacous beneath.

LITSEA Lam.

Litsea bicolor sp. nov.

Arbor circiter 8 m alta; ramis griseis, teretibus, glabris, ramulis junioribus dense ferrugineo-pubescentibus; foliis verticillatis, elliptico-obovatis, usque ad 35 cm longis, coriaceis, supra glabris, brunneis, nitidis, subtus albo-glaucescentibus, costa nervisque ferrugineis, plus minus tomentosis, apice breviter abrupteque acuminatis, basi acutis; fructibus fasciculatis, ellipsoideis, nigris, nitidis, circiter 2 cm longis, obtusis; calycibus auctis, disciformibus, circiter 1 cm diametro.

A tree about 8 m high. Branches terete, gray, glabrous, the young branchlets densely ferruginous-pubescent. Leaves verticillate, usually 5 in each whorl, elliptic-obovate, 25 to 35 cm long, 12 to 17 cm wide, the apex shortly and abruptly acuminate, the base acute, coriaceous, the upper surface glabrous, shining, dark-brown when dry, the lower surface pale, glaucous, nearly white, somewhat deciduous-tomentose, the nerves and midrib ferruginous-pubescent; nerves about 10 on each side of the midrib, very prominent beneath, curved-ascending, obscurely or not anastomosing, the reticulations lax; petioles ferruginous-pubescent, 3.5 cm long, stout. Flowers unknown. Fruit fascicled on the branches below the leaves, the pedicels stout, short, the calyx accrescent, disciform, about 1 cm in diameter, glabrous, the fruit ellipsoid, black, shining, glabrous, obtuse, about 2 cm long.

MINDANAO, Province of Surigao, Surigao, *Bolster 318*, April, 1906. N. v., *Hindang*.

A species will characterized by its large, verticillate leaves, which are very pale beneath.

Litsea hutchinsonii sp. nov.

Arbor circiter 10 m alta; ramis teretibus, glabris, ramulis junioribus dense ferrugineo-tomentosis; foliis oppositis vel suboppositis, oblongis, coriaceis, 10 ad 20 cm longis, 5 ad 8 cm latis, concoloribus vel subtus brunneis, supra glabris, nitidis, subtus parce pubescentibus, nervis utrinque circiter 12; inflorescentiis axillaribus, fasciculatis vel glomeratis, floribus umbellulatis, involucro biseriali, 4-phyllo; staminibus fertilibus 9, antheris omnibus introrsis, 4-locellatis.

A tree about 10 m high, nearly glabrous except the young branchlets and inflorescence. Branches terete, reddish-brown, glabrous, the young branchlets rather densely ferruginous-tomentose. Leaves opposite or subopposite, oblong, 10 to 20 cm long, 5 to 8 cm wide, coriaceous, of the same color on both surfaces, or the lower surface brownish, the upper surface glabrous, shining, the lower very sparingly pubescent, the apex acute, obtuse, or very obscurely acuminate, the base acute; nerves about 12 on each side of the midrib, beneath very prominent, obscurely anastomosing; petioles subglabrous, about 1 cm long. Flowers umbellate, the umbels involucrate, crowded in the leaf-axils, sessile or short-pedunculate, the involucral scales 4, concave, orbicular or obovoid, 4 to 5 mm long, outside ferruginous-pubescent. Staminate flowers 3 in each umbel, sessile or subsessile, the tube very short, ferruginous-pubescent outside, the segments 6, oblong, obtuse, subequal, 3 to 3.5 mm long, 1.5 mm wide, glabrous or nearly so. Fertile stamens 9, the longer filaments 2.5 mm long, glabrous or nearly so; anthers all introrse, all 4-locellate.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9148 Whitford & Hutchinson*, January, 1908.

A species apparently allied to *Litsea luzonica* (Bl.) F.-Vill., but with much larger, differently shaped leaves. As the genera in this group are defined in the Nat. Pflanzenfamilien, this species, having 9 fertile stamens, might be referred to *Actinodaphne*.

Litsea philippinensis sp. nov.

Arbor usque ad 20 m alta; foliis alternis, coriaceis, nitidis, glabris vel subglabris, oblongo-ellipticis, 10 ad 20 cm longis, apice rotundatis vel acutis, basi acutis; nervis utrinque 12 ad 15, prominentibus, reticulis validis subparallelis; petiolis 1 ad 2.5 cm longis; floribus capitulatis, capitulis globosis, fasciculatis vel in racemis brevibus axillaribus dispositis; calycis lobis 6, pubescentibus; staminibus fertilibus 12, filamentis villosis; fructibus oblongo-ovoideis, glabris, obtusis, circiter 3.5 cm longis, tubis auctis, cupulatis, circiter 2 cm diametro.

A tree 15 to 20 m high. Branches terete, stout, brown, glabrous, the branchlets somewhat ferruginous-pubescent. Leaves alternate, elliptic-oblong, 10 to 20 cm long, 5 to 10 cm wide, coriaceous, somewhat shining, usually brownish when dry, at least the nerves, not at all glaucous, the upper surface glabrous, or the midrib sometimes pubescent, the lower surface glabrous or the midrib and nerves usually more or less pubescent, the apex rounded or acute, the base usually acute; nerves 12 to 15 on each side of the midrib, very prominent, parallel, obscurely anastomosing near the margin of the leaf, the reticulations very distinct, subparallel; petioles pubescent, 1 to 2.5 cm long. Flowers in heads, axillary, fascicled or in short racemes, mostly from the branches below the leaves, in the axils of fallen leaves, the rachis, when present, stout, not exceeding 1

cm in length. Involucral bracts 4 or 5, pubescent, concave, orbicular or obovoid, the inner ones thinner, their margins ciliate, strongly imbricate, 6 to 8 flowers in each head. Calyx-tube slender, tubular, 2 mm long, cylindric, the lobes 6, 3 mm long, pubescent. Fertile stamens 12, their filaments slender, 3 mm long, clothed with long weak hairs. Fruit oblong-ovoid, glabrous, obtuse, about 3.5 mm long, the calyx-tube accrescent, persistent, cup-shaped, about 2 cm in diameter.

LUZON, Province of Bataan, Lamao River, *For. Bur. 7503 Curran*, September, 1907 (type), *For. Bur. 1363, 1794 Borden*, July, September, 1904, *Whitford 472*, July, 1904, *Williams 619*, February, 1904: Province of Rizal, Bosoboso, *For. Bur. 3171 Ahern's collector*, July, 1905. MINDORO, Bongabong River, *Whitford 1413*, April, 1906; Balete, *For. Bur. 6161 Merritt*, January, 1907. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 298*, February, 1906.

This species is well represented in our herbarium, especially in material from the Mount Mariveles region, but the specimen collected by Curran in September, 1907, is the first one secured with mature flowers, thus allowing accurate generic identification. The specimen from Mindanao, *Clemens 298*, is immature, being much more pubescent than the type, and may possibly represent a different species. It is well characterized by its oblong-elliptic, usually obtuse, strongly nerved leaves. Apparently allied to *Litsea grandis* Hook. f.

NEOLITSEA (Benth.) Merr.

Neolitsea villosa (Blume) comb. nov.

Litsea villosa Blume Mus. Bot. Lugd. Bat. 1 (1851) 349; Vidal Rev. Pl. Vasc. Filip. (1886) 226; Ceron Cat. Pl. Herb. (Manila) (1892) 143; Rendle in Journ. Bot. 34 (1896) 355. Meissn. in DC. Prodr. 15 (1864) 221.

Neolitsea zeylanica Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 57; non *Litsea zeylanica* C. & Fr. Nees.

LUZON, Province of Benguet, Mount Santo Tomas, *Williams 1986*, November, 1904; *Loher 4521;* Suyoc to Panai, *Merrill 4761*, November, 1905: Province of Rizal, Bosoboso, *For. Bur. 2674 Ahern's collector*, January, 1905: Province of Bataan, Mount Mariveles, *Whitford 119, 458*, May, July, 1904, *Elmer 6806* November, 1904, *Merrill 3204*, October, 1903, *For. Bur. 1337, 1586 Borden, 1503 Ahern's collector, 2617 Meyer, 6262 Curran:* Province of Pampanga, Mount Abu. *Bur. Sci. 1958, 1959 Foxworthy*, December, 1906: Province of Zambales, Mount Tapulao, *For. Bur. 8073 Curran;* Candelaria, *For. Bur. 8250 Curran & Merritt*, December, 1907. MINDORO, Mount Halcon, *For. Bur. 4369 Merritt, Merrill 5666;* Mount Malasumbu, *For. Bur. 8747 Merritt.* MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4681, 4695 Mearns & Hutchinson*, May, 1906.

This species is widely distributed in the Philippines, but is never found at low altitudes. It was previously confused by me with *Litsea zeylanica* C. & Fr. Nees, but appears not to be that species, but rather Blume's *L. villosa*, as identified by Vidal and Rendle. The specimens cited above show considerable variation, some of them having the leaves decidedly ferruginous-pilose beneath, but this indument is deciduous; pubescent and glabrous leaves can frequently be found on the same specimen. This densely villous form has been identified by Vidal as *Litsea cinnamomea* Blume, but whether correctly so or not, the Luzon form so named appears to me to be the same as *L. villosa=Neolitsea villosa.* This is doubtless the form approximately identified by Stepf, in his paper on the flora of Mount Kinabalu, as *Litsea zeylanica*, so far as his Philippine reference goes.

MACHILUS Nees.

Machilus nervosa sp. nov.

Arbor glabra circiter 6 m alta; foliis ovato-ellipticis, usque ad 12 cm longis, coriaceis, nitidis, subtus subglaucescentibus, grosse et pulcherrime reticulatis, nervis urtinque 6 vel 7, prominentibus, elevatis, anastomosantibus; paniculis axillaribus terminalibusque, circiter 7 cm longis; fructibus obovoideis, in sicco nigris, leviter angulatis, circiter 12 mm longis, perianthii lobis late ovatis, acutis, persistentibus, patulis.

A glabrous tree about 6 m high. Branches terete, lenticellate, grayish- or reddish-brown. Leaves ovate-elliptic, coriaceous, 7 to 12 cm long, 2.5 to 5 cm wide, base and apex acute, the upper surface shining, the lower, at least when young, subglaucous, nerves 6 or 7 on each side of the midrib, beneath very prominent, elevated, darker-colored than the surface of the leaf, curved-ascending, anastomosing, the primary reticulations lax, distinct; petioles 2 to 3 cm long. Panicles axillary and glabrous in fruit, about 7 cm long. Flowers unknown. Fruit obovoid, red when fresh, black and shining when dry, about 12 mm long, somewhat keeled or angled and obscurely reticulate, the persistent perianth-lobes broadly ovate, acute, 1.5 mm long, glabrous or their margins slightly pubescent, spreading.

Luzon, Province of Benguet Mount Ugo, *For. Bur. 10846 Curran, For. Bur. 18009 Merritt,* December, 1908, in hardwood forests in ravines at an altitude of about 2,000 m.

PHOEBE Nees.

Phoebe sterculioides (Elmer) comb. nov. § *Euphoebe.*
Persea sterculioides Elmer Leafl. Philip. Bot. 1 (1908) 295.

Arbor 7 ad 18 m alta; foliis subcoriaceis, obovatis vel oblanceolatis, circiter 18 cm longis, 8 cm latis, integris, apice breviter acuminatis, rariter acutis, basi sensim angustatis, supra glabris, subtus plus minus glaucescentibus, ferrugineo-pubescentibus; nervis utrinque 9 ad 11; paniculis axillaribus, ferrugineo-pubescentibus, angustis, usque ad 20 cm longis; calycis lobis 6, subaequalibus vel exterioribus admodum minoribus, pubescentibus, plus minus accrescentibus, persistentibus, erectis; staminibus fertilibus 9, 3-seriatis, antheris 4-locellatis, ordinis primi et secundi introrsis, ordinis tertii extrorsis.

Luzon, Province of Tayabas, Lucban, *Elmer 9121* (cotype), May 1907. Mindoro, near Lake Naujan, *For. Bur. 6793a, 6824, 6859 Merritt,* March-April, 1907. Negros, *7273, 7287, 7327 Everett,* May, 1907. Mindanao, Lake Lanao, Camp Keithley *Mrs. Clemens 518,* April-May, 1906, and six sheets without numbers.

This species appears to be not uncommon in the Philippines, and extends from central Luzon to Mindanao. In Mindoro it is know as *Baticulin,* a name applied to many different species of *Lauraceae,* in various genera. Specimens of this plant with young fruit show accrescent, persistent, and appressed calyx segments, which throws the species into *Phoebe,* as defined by Pax in Engler & Prantl's

Natürlichen Pflanzenfamilien, although Bentham & Hooker reduce *Phoebe* to *Persea*. In the original description of the species the outer series of stamens are described as having extrorse anthers, and the other series to have introrse anthers. I have reëxamined the type number and the reverse seems to be the case, the outer two series having introrse anthers, and the inner series having extrorse anthers. Apparently allied to the Malayan *Phoebe opaca* Blume.

DROSERACEÆ.

DROSERA Linn.

Drosera burmanni Vahl Symb. 3 (1794) 50; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 424; F.-Vill. Nov. App. (1880) 78, Diels in Pflanzenreich 26 (1906) 75.

Luzon, District of Bontoc, *For. Bur. 10995 Curran*, January, 1909, altitude about 700 m.

The fourth species of the genus for the Philippines, previously recorded from Panay by F.-Villar, but his record as to its occurring in the Archipelago not before verified.

India and Ceylon to southern Japan, south to Malaya and northern Australia.

HAMAMELIDACEÆ.

EMBOLANTHERA gen. nov.

Calycis tubus ovario adnatus, limbus irregulariter 2- vel 3-fidus, demum circumscisso-deciduus. Petala 5, lineari-elongata, basi utrinque valde auriculata vel alata. Stamina 5, petalis alternantia, filamentis brevissimis; antherae basifixae, loculis in valvis 2 verticaliter dehiscentibus, connectivo longe producto. Ovarium inferum, 2-loculare; styli 2, subulati, stigmatibus simplicibus; ovula in loculis solitaria, pendula. Arbor. Folia alterna, integra vel subintegra, persistentia, ovata vel oblonga, acuminata. Stipulae lanceolatae, membranaceae, deciduae, pectintae. Flores in spicas terminales densissime dispositi, calyce stellato-pubescente.

Embolanthera spicata sp. nov.

Arbor circiter 10 m alta, glabra, inflorescentiis exceptis. Ramis ramulisque tenuibus, griseis vel brunneis; foliis alternis firmiter chartaceis, ovatis vel oblongis, usque ad 10 cm longis, apice breviter acuminatis, basi rotundatis, acutis vel acuminatis, leviter inaequilateralibus, nitidis. Spicis foliis aequantibus vel subaequantibus, densis; floribus albis, 5-meris; petalis circiter 2 cm longis, 2 mm latis, basi utrinque valde auriculatis vel alatis; staminibus 5, connectivo longe producto.

A tree about 10 m high, glabrous or nearly so except the infloresence. Branches and branchlets terete, slender, gray or brown, slightly lenticellate. Leaves alternate, ovate to oblong, firmly chartaceous, shining, 7 to 10 cm long, 2 to 5 cm wide, gradually narrowed upward to the short-acuminate apex, the base rounded, acute, or slightly acuminate, usually somewhat inequilateral, the margins entire, recurved, sometimes slightly aculeate-denticulate near the apex; nerves 7 or 8 on

each side of the midrib, prominent beneath, anastomosing, the reticulations lax; petioles 5 to 10 mm long. Stipules deciduous, membranaceous, usually lanceolate, acuminate, 5 mm long or less, somewhat appressed-pubescent on the back, the margins below prominently pectinate, the tips of the teeth glandular. Spikes as long as the leaves or sometimes shorter, about 2.5 cm in diameter, densely many-flowered, the rachis somewhat pubescent, the bracteoles linear, pubescent, 1.5 mm long. Flowers white, sessile. Calyx-tube short, adnate to the ovary, pale-stellate-pubescent outside, the limb splitting irregularly into two or three ovate, acute or acuminate lobes, 4 to 5 mm long, membranaceous, somewhat reticulate-veined, stellate-pubescent outside, finally circumscissile and deciduous. Petals 5, about 2 cm long, 1.8 to 2 mm wide, the basal 3 mm strongly auricled, including the auricles 3 mm wide, narrowed above the auricles to 1 mm, incurved, and then linear-elongate, membranous, nerved, about 2 mm wide, acuminate. Staminodes none, unless represented by the auricles to the petals. Stamens 5, alternate with the petals, and inserted with them; filaments adnate to the corolla and falling with it, stout, about 1 mm long; anthers ovoid, about 1 mm long, the cells opening laterally each by two valves, the connective produced as a straight, 2 mm long, awn. Ovary inferior, 2-celled, each cell with a single pendulous ovule, the top of the ovary pubescent; styles 2, less than 1 mm long, slender; stigmas minute. Fruit unknown.

PALAWAN, Victoria Peak, *Bur. Sci. 739 Foxworthy*, March 24, 1906. A spreading tree about 10 m high, with a trunk 15 to 20 cm in diameter growing on the river bank at an altitude of about 250 m above the sea.

The genus above proposed is allied to *Maingaya* Oliver, of Penang and Perak, and to *Loropetalum* R. Br., of India and China, differing from both in its spicate infloresence, and in the strongly auriculate bases of the petals, from the former also in its different calyx and absence of staminodes, and from the latter also in its 4-merous flowers. It is apparently more closely allied to *Maingaya* than to *Loropetalum*, but seems to be distinct from both, and from all other hitherto described genera. But one genus of the family, *Sycopsis*, was previously known from the Philippines.

ROSACEÆ.

PARINARIUM Aubl.

Parinarium curranii nom. nov.

Parinarium racemosum Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 19; non Vidal Cat. Pl. Prov. Manila (1880) 29.

MASBATE, *Merrill 2614*, May, 1903 (type). LUZON, Province of Albay, *For. Bur. 10575 Curran*, June, 1908.

The original name of this species is invalidated by *Parinarium racemosum* Vidal, and accordingly the above new name is proposed for it. Vidal's species is not enumerated in Index Kewensis.

LEGUMINOSÆ.

ALBIZZIA Durazz.

Albizzia scandens sp. nov.

Frutex scandens, subglabra, usque ad 10 m alta; foliis bipinnatis, circiter 20 cm longis 4- vel 5-jugatis; foliolis oblongis vel elliptico-oblongis, 1 ad 2 cm longis, acutis vel apiculatis, leviter inequilateralibus; paniculis circiter 20 cm longis, parce pubescentibus; floribus sessilibus, capitulatis, extus parce pubescentibus; staminibus circiter 20, filamentis liberis.

A scandent shrub about 10 m high, subglabrous. Branches dark-colored when dry, terete, lenticellate. Leaves alternate, about 20 cm long, evenly 4- or 5-jugate, the common rachis slightly pubescent, 12 to 15 cm long, with a single large gland on the upper surface near the base, the stipules, if any, caducous, the base of the petiole subtended by a stout, somewhat recurved, thickened puvinus about 4 mm long; leaflets 8 to 12 pairs, crowded, oblong or elliptic-oblong, 1 to 2 cm long, 5 to 7 mm wide, chartaceous, somewhat inequilateral, the base broad, acute, the apex acute or apiculate, the lower surface paler than the upper, slightly pubescent. Panicles axillary and terminal, 20 cm long or less, slightly pubescent. Flowers white, sessile, in small capitate heads at the ends of the ultimate branchlets. Calyx about 1.5 mm long, slightly cinereous-pubescent outside, obscurely 5-toothed. Corolla slightly cinereous-pubescent outside, 4.5 mm long, the tube very slender below, widened above, the lobes oblong-ovate, acute, about 1.5 mm long, 1.2 mm wide. Stamens 20 or more; filaments about 12 mm long, free; anthers 0.2 mm long.

PALAWAN, Iwahig, *Bur. Sci. 829 Foxworthy*, May, 1906.

A species growing near the sea, climbing over *Xylocarpus*, allied to *Albizzia myriophylla* Roxb., of the Malay Peninsula, but with much fewer jugate leaves, less numerous and differently shaped leaflets, and free filaments.

BAUHINIA Linn.

Bauhinia monandra Kurz in Journ. As. Soc. Beng. 42[2] (1873) 73; Forest Fl. Brit. Burma 1 (1877) 395.

Bauhinia richardiana Wall. in Voigt. Hort. Suburb. Calcutt. (1845) 255, non DC. fide Prain.

Phanera maculata Rich. ex Teysm. & Binn. Cat. Hort. Bog. (1866) 268, non *Bauhinia maculata* Tenore.

Bauhinia krugii Urban in Ber. Deutsch. Bot. Ges. **3** (1885) 83.

Bauhinia kappleri Sagot in Ann. Sci. Nat. VI **13** (1882) 317; Urban Symb. Antill. **1** (1899) 83; Perk. Frag. Fl. Philip. (1904) 13; Merr. in Govt. Lab. Publ. (Philip.) **29** (1905) 17.

LUZON, Manila, *Merrill s. n.* November, 1903: Province of Pampanga, Arayat, *Warburg*, in Herb. Berol., *Merrill 3934*, October, 1904, *Bolster 51*, May, 1905:

Province of Rizal, *For. Bur. 3248 Ahern's collector*, August, 1905: Province of Bataan, Lamao, *For. Bur. 7350 Curran*, June, 1907. Bohol, *Bur. Sci. 1230 McGregor*, May, 1906.

There is no doubt but that *Bauhinia monandra* Kurz is the oldest valid name for this widely distributed species, and it is accordingly here adopted. Material supplied me by Mr. Craib of the Royal Botanic Garden, Calcutta, as representing Kurz's species is unquestionably the same as our Philippine specimens. In order to verify this I wrote to Dr. Prain, Director of the Royal Botanic Gardens, Kew, who has kindly examined all the material in the Kew herbarium, and who informs me that *Bauhinia krugii*, and *B. kappleri* are unquestionably identical with *B. monandra* of Kurz, the reductions being also verified by Mr. W. B. Hemsley, and Mr. N. E. Brown. My reduction of *Phanera maculata* Rich., is based on a specimen so named received from Buitenzorg, taken from a tree in the botanic garden so labelled, and said to have been received from Bourbon under that name. I suspected that it might be the same as *B. maculata* Tenore, but this is not the case, as Tenore's description does not at all apply to the present species, although Dr. R. Pampanini of Florence, who kindly supplied me with a copy of the original description, informs me that Tenore's type does not appear to be extant. The species is now widely distributed in the tropics of the World, and is probably a native of tropical America; it is certainly an introduced species in the Philippines.

CYNOMETRA Linn.

Cynometra luzoniensis sp. nov.

Arbor glabra, circiter 15 m alta; foliis unifoliolatis, foliolis coriaceis vel subcoriaceis, in sicco brunneis, nitidis, oblongis, usque ad 12 cm longis, reticulatis, apice acute acuminatis, basi late rotundatis vel subcordatis; fructibus axillaribus, racemosis, compressis, brunneis, circiter 2 cm longis, verrucoso-lenticellatis, obtusis.

A glabrous tree about 15 m high. Branches light-brown, terete, lenticellate. Leaves alternate, unifoliolate, the petiole stout, rugose, 3 to 4 mm long, the single leaflet sessile, oblong, coriaceous or subcoriaceous, brown and shining when dry, 5 to 12 cm long, 2 to 4.5 cm wide, the apex sharply acuminate, the base rather broad, rounded or slightly cordate; primary nerves about 8 on each side of the midrib, anastomosing, the secondary ones and reticulations nearly as distinct, the latter netted, rather close, distinct on both surfaces. Flowers unknown. Infrutescence of axillary, solitary racemes, the rachis about 1 cm long, marked by numerous pedicel-scars, the pedicels about 8 mm in length. Fruits (immature) compressed, inequilateral, the dorsal suture nearly straight, the ventral semicircular, about 2 cm long, 11 to 13 mm wide, brown, lenticellate-verrucose, apex and base rounded.

Luzon, Province of Tayabas, Laguimanoc, *Merrill 2128*, April, 1903.

A species closely allied to *Cynometra simplicifolia* Harms, but with larger much more sharply acuminate leaves which are broad and rounded or subcordate at the base and with quite different, much more prominent venation and reticulation. The inflorescence of *C. simplicifolia* is fasciculate and the fruits are usually somewhat falcate, the dorsal suture being frequently incurved.

FLEMINGIA Roxb.

Flemingia lineata (Linn.) Roxb. Hort. Beng. (1814) 56; Fl. Ind. 3:341; Baker in Hook. f. Fl. Brit. Ind. 2 (1876) 228; F.-Vill. Nov. App. (1880) 67.

Hedysarum lineatum Linn. Sp. Pl. (1753) 1054.

Flemingia blancoana Llanos Fragm. (1851) 80; Blanco Fl. Filip. ed. 3, 4¹:62.

LUZON, Province of Bulacan, near Malolos, *Mrs. Templeton*, February, 1909.

A species previously known from the Philippines only by F.-Villar's record, and to which he reduced, and apparently correctly so, *Flemingia blancoana* Llanos.

India to Siam, the Malay Archipelago and northern Australia.

DESMODIUM Desv.

Desmodium retroflexum (Linn.) DC. Prodr. 2 (1825) 336; Baker in Hook. f. Fl. Brit. Ind. 2 (1876) 170; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 23 (1887) 176.

LUZON, Province of Nueva Ecija, Cabanatuan, *Bur. Sci. 5278 McGregor*, September, 1908.

Himalayan region to Tenasserim and southern China; new to the Philippines.

ERYTHROPHLOEUM Afzel.

Erythrophloeum densiflorum (Elm.) comb. nov.

Cynometra densiflora Elm. Leafl. Philip. Bot. 1 (1907) 222.

Arbor glabra, inflorescentiis exceptis, usque ad 25 m alta; foliis alternis abrupte bipinnatis, pinnis 1- vel 2-jugatis; foliolis oppositis, abrupte pinnatis, 3- ad 5-jugatis, subcoriaceis, nitidis, in sicco brunneis vel pallidis, usque ad 15 cm longis, valde acuminatis, basi rotundatis vel acutis, leviter inaequalibus; floribus parvis, spicatis, spicis pubescentibus, in paniculis terminalibus vel subterminalibus dispositis; petalis 5, imbricatis, circiter 4 mm longis; ovarium stipitatum, 4-ovulatum; leguminibus ligneis, oblongis vel anguste oblongo-obovatis, obtusis, compressis, basi angustatis, longitudinaliter laxe reticulato-striatis, rectis vel leviter falcatis, dehiscentibus, usque ad 18 cm longis, 4.5 cm latis; seminibus 1 ad 4, compressis, orbicularibus, circiter 3 cm diametro.

The type of this species was collected by Mr. Elmer *No. 9013*, near Lucban, Province of Tayabas, Luzon, in flower, and described by him as *Cynometra densiflora*. It is represented by the following additional material; LUZON, Province of Tayabas, Bulin, *For. Bur. 10272 Curran*, with nearly mature fruit; Guinayangan, *For. Bur. 12507 Rosenbluth;* Dugatan, *For. Bur. 10215 Curran;* Apad, *For. Bur. 11513 Whitford*. A sterile specimen from Mindanao, *For. Bur. 9163 Whitford & Hutchinson*, may be referable here. Locally known to the Tagalogs as *Camatog* or *Calamantao*.

A most interesting addition to our knowledge of the Philippine flora, the genus, up to the present time consisting of about six species, mostly in Africa and Madagascar, one in Australia and one in China.

KINGIODENDRON Harms.

Kingiodendron alternifolium (Elmer) Merrill & Rolfe, comb. nov.

Cynometra alternifolia Elmer Leafl. Philip. Bot. 1 (1907) 223.

Hardwickia alternifolia Elmer l. c. (1908) 362.

Arbor magna, glabra; foliis imparipinnatis, alternis, rariter oppositis,

foliolis 3 ad 5, coriaceis, elliptico-ovatis vel oblongo-ellipticis, alternis, valde glanduloso-punctatis, plus minus inaequilateralibus, apice acuminatis, basi acutis vel obtusis; paniculis axillaribus; calycibus 5- vel 4-meris, lobis valde imbricatis, glanduloso-punctatis; ovario sessile, dense villoso; fructibus suborbicularibus, ellipticis vel obovoideis, crassis, leviter compressis, brunneis, ligneis, 3 ad 4 cm longis, circiter 3 cm latis, 2.5 cm crassis, indehiscentibus; seminibus solitariis, albumine ruminato.

The type of this species is *Elmer 7366* from Leyte, the specimens with immature fruits and without flowers, which perhaps accounts for its originally being described as *Cynometra*. Later Mr. Elmer transferred it to *Hardwickia*, following the conception of that genus as defined by Bentham and Hooker. Harms has however proposed the new genus *Kingiodendron*, based on *Hardwickia pinnata* Roxb., to which the present species is allied. As we consider *Kingiodendron* to be a valid genus, the Philippine species is here transferred as the second species of the genus.

In addition to the type, cited above, the species is represented by the following specimens: LUZON, Province of Tayabas, Guinayangan, *Bath s. n.*, May, 1904 (fruit), Mulanaw and San Narciso, *For. Bur. 10327, 10354 Curran*, April, 1908 (fruit): Province of Camarines, *For. Bur. 10671 Curran* (sterile): Province of Sorsogon, *For. Bur. 10624 Curran* (sterile). MASBATE, *Merrill 2761*, June, 1903 (fruit), *Whitford 1679*, October, 1906 (sterile). TICAO, *For. Bur. 1084 Clark*, May, 1904 (fruit). PANAY, Miagao, *Vidal 2468* in Herb. Kew. MINDANAO, District of Zamboanga, *For. Bur. 6567 Hutchinson*, March, 1907 (immature fruit); Port Banga, *For. Bur. 9301, 9007, 11036 Whitford & Hutchinson* (in flower).

The present species is a timber tree of considerable importance, being commercially known as *Batete*. The wood structure has been considered by Foxworthy[6] who states that it is much like that of *Sindora supa* Merr., in structure, but is darker and with a greater amount of oil. It is widely distributed in the central and southern Philippines, and is known by the following native names V., *Batete;* T., *Dangay;* B., *Salalangin;* in Zamboanga as *Palo Maria* and *Bitanhol*, but these two names belong properly to *Calophyllum*.

MEZONEURUM Desf.

Mezoneurum latisiliquum (Cav.) comb. nov.

Bauhinia ? latisliqua Cav. Icon. 5 (1799) 5, *t. 408*, in part, excluding description and figure of leaves.

Mezoneurum glabrum Desf. in Mém. Mus. Paris 4 (1818) 245, *t. 10;* DC. Prodr. 2 (1825) 484; Baker in Hook. f. Fl. Brit. Ind. 2 (1878) 258; F.-Vill. Nov. App. (1880) 70; Miq. Fl. Ind. Bat. 1[1] (1855) 103; Vidal Phan. Cuming. Philip. (1885) 110, Rev. Pl. Vasc. Filip. (1886) 114; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 64.

Caesalpinia torquata Blanco Fl. Filip. (1837) 336.

Mezoneurum procumbens Blanco l. c. ed. 2 (1845) 235, ed. 3, 2:73.

LUZON, Province of Pampanga, Arayat, *Merrill 1438:* Province of Rizal, *Merrill 1711:* Province of Bataan, *For. Bur. 5958 Curran; Whitford s. n.; Williams 701:* Province of Laguna, Los Baños, *Elmer;* Bur. Sci. *6095 Robinson.* MINDORO, Paluan, *Merrill 956; For. Bur. 9748 Merritt.* NEGROS, *For. Bur. 7315 Everett.* BASILAN, *For. Bur. 3978 Hutchinson; Hallier.* MINDANAO, Province of

[6] *This Journal*, 2 (1907) Botany 376.

Surigao, *Bolster 366;* Lake Lanao, Camp Keithley, *Mrs. Clemens 262;* District of Davao, *Copeland 470.*

A common and widely distributed species in the Philippines, for which the earliest specific name is here adopted. Cavanilles' *Bauhinia ? latisiliqua* is a mixture, the leaves being those of a true *Bauhinia*, but the fruit manifestly a *Mezoneurum*. It was based on material collected in the Philippines by Née, the fruit, at least, coming from the town of Cavinti in Laguna Province, Luzon. As the specific name was taken from fruit characters, and as the fruit as figured and described is manifestly *Mezoneurum*, I consider that *Bauhinia ? latisiliqua* is typified by the fruit, and that it should be considered as *Mezoneurum*. Local names, T., *Camut pusa, Camut cabag, Cabit cabag, Sagnit, Sapnit;* V., *Tugabang, Ugabang, Sampinit;* in Basilan *Sokit, Sampinit.*

Timor, and according to Baker, in Tenasserim.

SESBANIA Pers.

Sesbania roxburghii nom. nov.

Aeschynomene paludosa Roxb. Hort. Beng. (1814) 56, nomen, Fl. Ind. 3 (1832) 333.

Sesbania paludosa Prain in Journ. As. Soc. Beng. 6^2 (1897) 82, non Jacq., 1825.

Sesbania grandiflora Miq. Fl. Ind. Bat. 1^1 (1855) 333, non Pers.

Sesbania cochinchinensis Kurz in Journ. As. Soc. Beng. 45^2 (1876) 271, non DC.

Sesbania aculeata var. *paludosa* Baker in Hook. f. Fl. Brit. Ind. 2 (1876) 115, in part, and excluding the synonym *Aeschynomene uliginosa.*

LUZON, Province of Laguna, Siniloan, *Bur. Sci. 6530 Robinson;* Santa Maria Mavitac, *For. Bur. 10098 Curran,* in shallow water in Lake Bay, T., *Balakla.*

Bengal to Burma, southern China and Java.

As there appears to be no valid specific name for this species, the above is here proposed.

RUTACEÆ.

EVODIA Forst.

Evodia monophylla sp. nov.

Arbuscula glabra circiter 3 m alta; foliis oppositis, unifoliolatis, foliolis 6 ad 13 cm longis, elliptico-lanceolatis, firmiter chartaceis, utrinque pallidis nitidisque, apice acuminatis, basi acutis; cymis pedunculatis, circiter 1 cm longis; floribus 4-meris, ovario obtuse 4-angulato.

A glabrous shrub about 3 m high. Branches terete, slender, grayish or grayish-brown, shining, striate when dry. Leaves opposite, unifoliolate, the petiole 0.8 to 3 cm long, the petiolule short; leaflet firmly chartaceous, elliptic-lanceolate, pale and shining on both surfaces, 6 to 13 cm long, 2 to 4.5 cm wide, entire, glabrous, the apex acuminate, acumen blunt, the base acute; primary nerves 10 to 13 on each side of the midrib, rather distant, anastomosing, the secondary nerves and rather lax reticulations almost as prominent. Cymes axillary, solitary, peduncled, about 1 cm long, when young slightly puberulent. Pedicels about 2 mm long. Calyx-lobes 4, ovate, 1 mm long. Petals 4, oblong-elliptic, acute, punctate, 2.5 mm long, 1.3 mm wide. Stamens 4, alternating with the petals; filaments 1.7 mm long; anthers 0.8 mm long.

Disk prominent, obtusely 4-angled, somewhat undulate. Ovary with four obtuse lobes, sunk in the disk; style very short, simple. Immature carples glabrous.

MINDORO, Mount Halcon, *Merrill 6169*, November 9, 1906, in forests at about 750 m altitude; flowers pink.

A species readily recognizable by its unifoliolate leaves, pale, shining, elliptic-lanceolate, acuminate leaflets, and very short axillary cymes.

MELIACEÆ.

AGLAIA Lour.

Aglaia badia sp. nov. § *Euaglaia.*

Arbor 20 ad 25 m alta, ramulis paniculisque densissime badio-lepidotis, subnitentibus; foliis alternis, imparipinnatis, 4- vel 5-jugatis, 20 ad 25 cm longis; foliolis oppositis, in sicco brunneis, utrinque decidue brunneo-lepidotis; paniculis axillaribus, folia subaequantibus, pedunculatis; floribus racemoso-dispositis, minutis, 5-meris.

A tree 20 to 25 m high the branches, petioles and infloresence somewhat shining, minutely and very densely brown-lepidote. Leaves alternate, odd-pinnate, 4- or 5-jugate, 20 to 25 cm long, the rachis and petiolules minutely and densely lepidote; leaflets opposite, brown when dry, chartaceous, oblong to elliptic-oblong, somewhat shining, deciduously lepidote on both surfaces, 5 to 10 cm long, 2.5 to 4.5 cm wide, the terminal one sometimes larger, equilateral, the lateral ones somewhat inequilateral; nerves 10 to 12 on each side of the midrib, not prominent, the reticulations fine, rather lax; petiolules 8 mm long or less. Panicles axillary, peduncled, nearly as long as the leaves, branched in the upper two-thirds, the rachis, branches, branchlets and calyces minutely and densely brown-lepidote, shining, the lower primary branches 7 cm long, the upper ones shorter. Flowers minute, racemosely arranged on the ultimate branchlets, their pedicels 1 to 2 mm long. Calyx about 1 mm long, densely lepidote, its teeth broad, rounded. Petals about 1 mm long, glabrous. Staminal tube 0.5 mm long, truncate or obscurely toothed free, glabrous; anthers 5, borne on the upper part of the tube, included.

LUZON, Province of Cagayan, San Vicente, *For. Bur. 7082, 11305 Klemme*, May, 1907, April, 1908, in dense flat- and hill-forests, altitude 5 to 30 m. Cag., *Salotoi;* Neg., *Masaleng.*

A species in the group with *Aglaia hexandra* Turcz., but not closely allied to it, well characterized by its brownish color and densely disposed, minute, somewhat shining, lepidote scales.

Aglaia bicolor sp. nov. § *Euaglaia.*

Arbor 15 ad 25 m alta, ramulis foliolis subtus inflorescentiisque densissime cupreo-lepidotis, nitidis; foliis alternis, imparipinnatis, 30 ad 45 cm longis, foliolis 9 ad 11, alternis firmiter chartaceis vel subcoriaceis, elliptico-oblongis vel oblongo-lanceolatis, utrinque acuminatis, base valde

inaequaliteralibus, supra glabris; paniculis folia subaequantibus, multifloris; floribus minutis, 5–meris, pedicellatis, in ramulis ultimis racemoso-dispositis; fructibus ellipsoideis vel anguste obovoideis, circiter 1.5 cm longis, 1–locellatis.

A tree 15 to 25 m high, the branchlets, inflorescence, rachis of the leaves, petiolules and under surfaces of the leaflets very densely cupreous-lepidote, shining. Branches rather stout, lepidote, brownish, striate, glabrous. Leaves alternate, odd-pinnate, 30 to 45 cm long, the petiole and rachis cupreous-lepidote, terete; leaflets 9 to 11, alternate, petiolate, firmly chartaceous or subcoriaceous, elliptic-oblong to oblong-lanceolate, 8 to 15 cm long, 3 to 6 cm wide, the apex rather abruptly acuminate, the base very strongly inequilateral, acuminate, the upper surface glabrous, rarely with very few scattered scales, shining, grayish-green when dry, the lower very densely cupreous-lepidote, also shining; nerves 10 to 12 on each side of the midrib, straight, rather distinct, obscurely anastomosing, the reticulations obsolete; petiolules 1 to 1.5 cm long. Panicles axillary, about as long as the leaves in anthesis, shorter in bud, all parts very densely cupreous-lepidote, shining, many-flowered, the lower primary branches often 20 cm in length. Flowers minute, pedicellate, racemosely disposed on the ultimate branchlets, their pedicels 1 mm long or less. Calyx obscurely toothed, densely lepidote. Petals 5, orbicular, glabrous, 0.6 mm in diameter or less. Staminal tube obovoid, 0.7 mm long, glabrous, free from the petals, slightly toothed. Anthers 5, inserted near the apex of the tube, sessile, inflexed, 0.2 mm long. Fruits ellipsoid or narrowly obovoid, 1.5 cm long, densely cupreous-lepidote, shining, 1–celled, 1–seeded.

LUZON, Province of Cagayan, San Vicente, *For. Bur. 4288 Klemme*, June, 1906, (type): Province of Ilocos Sur, San Quintin, *For. Bur. 7117 Klemme*, April, 1907: Province of Rizal, Antipolo, *Merrill 1659*, March, 1903, *For. Bur. 413 Ahern's collector*, February, 1904.

A species manifestly allied to *Aglaia denticulata* Turcz., but distinguished by its more numerous leaflets, which are very much more densely lepidote beneath, longer panicles and much smaller flowers. Tagalog (Rizal) *Salamoñgay;* Negrito (Cagayan) *Matanaota;* Ilocano, *Sal-lapugud.*

Aglaia everettii sp. nov. § *Hearnia.*

Arbor 10 ad 20 m alta; foliis alternis, circiter 30 cm longis, imparipinnatis, 2–jugatis, glabris; foliolis oppositis, chartaceis vel submembranaceis, in sicco pallidis, nitidis, late ellipticis vel elliptico-obovatis, usque ad 20 cm longis, apice breviter acuminatis, basi rotundatis vel acutis, nervis utrinque 10 ad 14; paniculis axillaribus, foliis longioribus, multifloris, plus minus ferrugineo-lepidotis, pubescentibus; floribus 5-meris, pedicellatis, in ramulis ultimis dense racemose dispositis.

A tree 10 to 20 m high, glabrous except the inflorescence. Branches terete, light-gray, shining, lenticellate. Leaves alternate, about 30 cm

long, odd-pinnate, 2-jugate; leaflets opposite, chartaceous to submembranaceous, when dry pale and shining, glabrous, broadly elliptic to elliptic-obovate, 12 to 20 cm long, 7 to 10 cm wide; nerves 10 to 14 on each side of the midrib, distinct, anastomosing near the margin, the reticulations fine, distinct; petiolules stout, 1 to 1.4 cm long. Panicles axillary, equaling or longer than the leaves, 50 cm long or less, ferruginous-lepidote and somewhat ciliate-pubescent, the lower branches frequently 20 cm in length. Flowers rather densely racemosely arranged on the ultimate branchlets, the pedicels about 1 mm long. Sepals 5, free or nearly so, orbicular-ovate, obtuse, 1 mm long, their margins ciliate. Petals 5, ovate or orbicular-ovate, glabrous, obtuse, 2 mm long. Staminal tube depressed-globose, glabrous, free from the petals, truncate. Stamens 5, inserted on the edge of the tube, inflexed. Fruit narrowly ellipsoid, rounded at the apex, brown, 3 to 4 cm long, 1- or 2-celled, each cell with a single seed.

NEGROS, Province of Negros Occidental, Painguion River, *For. Bur. 7319 Everett*, March, 1907 (type); Cadiz, *For. Bur. 15035 Danao*, March, 1908. CEBU, Mount Licos, *For. Bur. 6452 Everett*, February, 1907. Visayan *Bubua, Bunguas*.

AZADIRACHTA A. Juss.

Azadirachta integrifoliola sp. nov.

Arbor glabra, circiter 30 m alta; foliolis 12 ad 16, inferioribus alternis, superioribus subopppositis, ovato-lanceolatis, integris, membranaceis, acuminatis vel acutis, basi inaequilateralibus, rotundatis; paniculis foliis longioribus, anguste pyramidatis, circiter 45 cm longis; floribus pedicellatis, circiter 7 mm longis; ovario glabro, 3-loculari.

A tree about 30 m high, glabrous. Leaves equally pinnate, about 30 cm long, glabrous: leaflets 12 to 16, ovate-lanceolate, the lower ones alternate, the upper opposite or subopposite, membranaceous, glabrous, shining above, 6 to 9 cm long, 2.5 to 3.5 cm wide, entire, the apex acute or somewhat acuminate, the base rather strongly inequilateral, broad and rounded on one side of the midrib, narrower and usually acute on the other; nerves 6 to 8 on each side of the midrib, distinct beneath, obscurely anastomosing, the reticulations lax, obscure; petiolules very short, the leaflets almost sessile. Panicles longer than the leaves, about 45 cm long, glabrous, narrowly pyramidal, many flowered. Sepals ovate, acuminate, about 1 mm long, the margins slightly ciliate. Petals free, oblong-lanceolate, acute or obtuse, about 7 mm long, 1.8 to 2 mm wide, recurved, nearly glabrous outside, inside puberulent, the margins slightly puberulent-ciliate. Staminal tube cylindric, 6 mm long, glabrous outside, slightly narrowed in the middle, somewhat hairy in the upper half inside, the apex with 10 small teeth. Stamens 10, inserted opposite the teeth, the anthers sessile, 0.8 mm long, their apices slightly exserted. Disk none. Ovary ovoid, glabrous, 3-celled, each cell with two collateral ovules; style 4 mm long; stigma slightly 3-lobed.

PALAWAN, Malcampo, *For. Bur. 11248 Manalo*, March, 1908, said by the collector to be common in old clearings, and locally known as *Marango*. The height is given as 30 m and the diameter of the trunk as 90 cm, while the timber is said to be used for construction purposes.

Azadirachta A. Juss. has previously been a monotypic genus, consisting of the one species *A. indica* A. Juss. extending from India to Java. The species above described can at once be distinguished by its entire leaflets, its panicles much longer than the leaves, not shorter as in *A. indica*, and its longer flowers.

HEYNEA Roxb.

Heynea sumatrana Miq. Ann. Mus. Bot. 4 (1868) 60; C. DC. Monog. Phan. 1 (1878) 714.

Scutinanthe engleri Elm. Leafl. Philip. Bot. 1 (1908) 298.

LUZON, Province of Tayabas, Lucban, *Elmer 9179;* Atimonan, *For. Bur. 6702 Kobbe.* BASILAN, *Hallier s. n.*

The first representative of the genus to be found in the Philippines, for *Trichilia rimosa* Blanco, although reduced to *Heynea trijuga* Roxb., by C. DeCandole, is, I feel certain, not a *Heynea*. The type of *Scutinanthe engleri* Elm., is a specimen with very young fruits, mature fruits or flowers not present, and is manifestly referable to *Heynea* and not a *Burseraceous* plant, where it was placed by Mr. Elmer. The Philippine specimens agree closely with those of *H. sumatrana* Miq., taken from cultivated trees in the Buitenzorg Botanical Garden, and there seems to be little doubt as to their specific identity. Miquel's species has, however, been reduced by King to *Heynea trijuga* var. *multijuga* C. DC., but a specimen of *Wallich 1259* from Penang, the type number of this variety, is in our herbarium and does not agree with our material of *H. sumatrana*, nor with Miquel's description, and it seems that while *Heynea sumatrana* Miq., is not the same as *H. trijuga* var. *multijuga*, still it may not be specifically distinct from *H. trijuga* Roxb.

Sumatra.

DYSOXYLUM Blume.

Dysoxylum klemmei sp. nov. § *Eudysoxylum.*

Arbor subglabra, circiter 16 m alta; foliis alternis, imparipinnatis, 40 ad 45 cm longis, rhachidibus densissime ferrugineo-puberulis; foliolis circiter 15 cm longis, alternis vel suboppositis, circiter 17, glabris, nitidis, brunneis, apice acuminatis, basi acutis, valde inaequilateralibus, reticulis obsoletis; paniculis axillaribus folia subaequantibus, densissime ferrugineo-puberulis; floribus 4-meris, circiter 5 mm longis.

A tree, nearly glabrous except the petioles, young branches and inflorescence. Leaves alternate, 40 to 50 cm long, odd-pinnate, the leaflets about 17, the rachis densely ferruginous-puberulent; leaflets alternate or subopposite, oblong, about 15 cm long, 4 to 5 cm wide, subcoriaceous, shining, dark-brown when dry, glabrous, the apex acuminate, the base very strongly inequilateral, one side much narrower than the other and always acute or acuminate, the other side often rounded, sometimes acute and extending farther down the midrib; nerves 8 to 13 on each side of the midrib, not prominent, the reticulations obsolete; petiolules about 1 cm long, glabrous or somewhat puberulent. Panicles axillary, about as

long as the leaves, densely ferruginous-puberulent, peduncled, the lower branches about 7 cm long, the upper ones shorter. Flowers pedicelled, glabrous. Calyx about 2.5 mm in diameter, short, obscurely 4-toothed. Petals 4, oblong, 4 to 5 mm long, about 1.4 mm wide, glabrous. Staminal tube cyclindric, 3 mm long, irregularly toothed at the apex; anthers 8, oblong, 1 mm long, borne at the top of the tube, included. Disk cylindric, 1 mm long, free, the apex densely ferruginous-hirsute. Ovary somewhat ferruginous-hirsute; style 2.5 mm long, glabrous.

Luzon, Province of Cagayan, San Vicente, *For. Bur. 7079 Klemme*, May, 1907, in dense hill-forests at an altitude of about 30 m. Neg., *Tibungao*.

A species in the group with *Dysoxylum thyrsoideum* Hiern., but very different from that species and apparently also from all other allied forms.

EUPHORBIACEÆ.

AGROSTISTACHYS Dalz.

Agrostistachys pubescens sp. nov.

Arbor parva, ramulis, subtus foliis, inflorescentiisque plus minus pubescentibus; foliis oblongo-obovatis, membranaceis vel chartaceis, circiter 22 cm longis, apice acuminatis, basi angustatis, cuneatis, minute irregulariter glanduloso-serratis vel subintegris, supra glabris, subtus ad costam nervosque plus minus villosis; inflorescentiis foliis longioribus; fructibus dense pubescentibus.

A small tree, the branchlets, inflorescence and the under surface of the leaves more or less pubescent. Branches terete, grayish-brown, pubescent, sparingly lenticellate. Leaves membranaceous or chartaceous, 18 to 25 cm long, 9 to 11 cm wide, oblong-obovate, the apex rather abruptly acuminate, gradually narrowed from just below the middle to the cuneate base, subentire or slightly and distantly irregularly glandular-serrate, the upper surface glabrous, shining, the lower more or less villous on the midrib and lateral nerves; nerves prominent, parallel, 25 to 30 on each side of the midrib, the reticulations distinct, parallel; petioles stout, pubescent, less than 5 mm long. Inflorescence axillary, solitary, exceeding the leaves, incipient spikes very short, composed of numerous imbricate, ovate, acuminate, more or less pubescent bracts mostly less than 1 mm in length, not distichous; mature inflorescence slightly pubescent, the rachis 40 to 60 cm long. Flowers unknown. Fruits dry, subglobose, dehiscent, 3-celled, about 8 or 9 mm in diameter, outside densely olivaceous- or yellowish-pubescent; seeds subglobose, about 5 mm in diameter, shining.

Luzon, Province of Bataan, Mabayo, *For. Bur. 5940 Curran*, January, 1907, in bamboo thickets along streams.

A species readily recognizable in the genus by its pubescence, the second one to be found in the Philippines.

ANTIDESMA Burm.

Antidesma cordato-stipulaceum sp. nov.

Arbuscula glabra 2 ad 3 m alta; foliis oblongis, chartaceis vel subcoriaceis, nitidis, prominente acuminatis, apiculatis, usque ad 20 cm longis, nervis utrinque 12 ad 14; stipulis persistentibus, foliaceis, late ovatis vel suborbicularibus, basi cordatis, 1 ad 2.5 cm longis; floribus masculinis spicatis, 4- vel 3-meris, calycibus subtruncatis; staminibus 3, rariter 4; floribus femineis racemosis, calycibus breviter obscureque 5-dentatis, stigmatibus subterminalibus; fructibus in sicco compressis, 1 cm longis, basi rotundatis, apice obscure acuminatis.

A glabrous shrub 2 to 3 m high. Branches slender, terete, glabrous, light-gray. Leaves oblong, chartaceous or subcoriaceous, shining, 12 to 20 cm long, 4 to 8 cm wide, entire, the apex rather prominently acuminate, the acumen blunt, apiculate, base rounded or acute; nerves 12 to 14 on each side of the midrib, prominent beneath, curved-spreading, anastomosing; petioles about 1 cm long; stipules foliaceous, broadly ovate to suborbicular, 1 to 2.5 cm long, 1.5 cm wide or less, apex acute, rounded, or sometimes somewhat acuminate, base broad, cordate, usually clasping the stem. Staminate inflorescence very slender, of 5 to 10 cm long more or less fascicled spikes from the leaf axils, or from axils below the leaves; flowers minute, about 1.2 mm in diameter, glabrous, sessile, solitary, more or less scattered, the calyx somewhat saucer-shaped, subtruncate or very obscurely toothed; stamens usually 3, rarely 4, their filaments 0.5 mm long. Pistillate inflorescence of slender, axillary, solitary racemes, 15 cm long or less; flowers more or less scattered in the lower portion, somewhat crowded above, their pedicels 1 mm long or less, each subtended by a minute, oblong, 0.5 mm long bracteole; calyx somewhat cupshaped, obscurely 5-toothed, the margins minutely pubescent; ovary glabrous, ovoid; styles terminal or subterminal. Fruit, when dry, compressed, narrowly ovate, somewhat inequilateral, base rounded, apex somewhat acuminate, 1 cm long, reticulate, reddish, crowned by the somewhat falcate styles.

Mindoro, Baco River, *Merrill 1807, 4048,* the former with pistillate flowers, the latter with staminate ones, *McGregor 179, 311,* the former with pistillate flowers, the latter with fruits; Subaan, *For. Bur. 6794 Merritt,* with staminate flowers.

A very characteristic species, readily recognized by its comparatively large, persistent, ovate, cordate, foliaceous stipules, as well as by its very slender inflorescence, the staminate being spicate, and the pistillate racemose.

Antidesma subcordatum sp. nov.

Arbor 10 ad 15 m alta, ramulis, inflorescentiis, foliisque plus minus pubescentibus; foliis oblongis vel ovato-oblongis, usque ad 12 cm longis, membranaceis vel chartaceis, plus minus nitidis, utrinque dense molliterque pubescentibus, apice acuminatis, basi cordatis, subcordatis vel

rariter rotundatis, nervis utrinque circiter 8; inflorescentiis masculinis spicatis, spicis densis, densissime pubescentibus, solitariis vel fasciculatis, terminalibus, 3 ad 7 cm longis, circiter 3 mm diametro, floribus 5- rariter 6-meris, calycis lobis brevibus, densissime pubescentibus; inflorescentiis femineis spicatis, spicis terminalibus, solitariis; stigmatibus terminalibus.

A tree more or less pubescent in all parts, 10 to 15 m high. Branches terete, reddish- or grayish-brown, nearly glabrous, lenticellate, the younger branchlets densely and softly pubescent. Leaves oblong to ovate-oblong, 6 to 12 cm long, 3 to 6 cm wide, membranaceous or subchartaceous, more or less shining, in the typical form densely and softly pubescent on both surfaces, entire, the apex rather abruptly and somewhat broadly acuminate, the acumen apiculate, base rather broad, cordate or subcordate, sometimes rounded; nerves about 8 on each side of the midrib, distinct, somewhat ascending, laxly anastomosing; petioles softly pubescent, 5 to 10 mm long. Staminate inflorescence spicate, spikes solitary or fascicled, usually terminating the short lateral branchlets, very dense, cylindric, very densely pubescent, 3 to 7 cm long, about 3 mm in diameter; calyx lobes 5, short, narrowly ovate, acute or obtuse, about 0.6 mm long, very densely pubescent. Stamens 4 to 6; filaments glabrous, 1.5 to 2 mm long. Rudimentary ovary densely lanate. Pistillate inflorescence racemose, the racemes terminating the short lateral branches, solitary, 4 to 6 cm long, the rachis, calyces and bracteoles densely pubescent, the pedicels nearly glabrous; bracteoles narrowly ovate, more or less acuminate, 1 mm long; pedicels glabrous or nearly so, 1 to 1.5 mm long. Calyx cylindric-cupshaped, 1 mm in diameter, pubescent, obscurely 5-toothed. Ovary narrowly elliptic, equilateral, with few scattered hairs; styles terminal, each cleft, and the arms also cleft.

Luzon, Province of Rizal, Bosoboso, *Bur. Sci. 1114, 4564 Ramos*, the former with staminate, the latter with pistillate flowers; from the same province also *Merrill 2813*, and *For. Bur. 3160 Ahern's collector.*

A species well characterized by its very dense cylindric staminate spikes which are very densely pubescent, its more lax racemose pistillate spikes, and its softly pubescent leaves which are acuminate, the base cordate or subcordate and usually oblong or ovate-oblong. Probably as closely allied to *A. ghaesembilla* Gaertn., as to any other species, but very different in vegetative characters.

ACTEPHILA Blume.

Actephila dispersa (Elmer) comb. nov.

Pimelodendron dispersum Elmer Leafl. Philip. Bot. 1 (1908) 308.

Arbuscula glabra, circiter 3 m alta; foliis submembranaceis, oblongis vel obovatis, integris, nitidis, 15 ad 30 cm longis, apice acutis, vel obscure acuminatis, vel obtusis, basi subacutis vel abrupte obtusis, nervis utrinque 9 ad 13; petiolo 2 ad 4 cm longo; floribus ignotis; fructibus axillaribus, longe pedunculatis, pendulis, depresso-globosis, circiter 2 cm diametro, obscure trigonis, trilocularibus, loculidice dehiscentibus; seminibus in loculis 2.

LEYTE, Palo, *Elmer 7245*, January, 1906, type number.

This species was originally described by Mr. Elmer as a *Pimelodendron*, but the presence of two seeds in each cell of the mature fruit excludes it at once from that genus and all allied ones. It seems, however, to be referable to *Actephila*, and to be closely allied to *Actephila gigantifolia* Koorders of Celebes, but the latter species is described as having the leaves abruptly long-acuminate. The five small calyx-segments described by Mr. Elmer are the squamiform petals, the sepals and petals persisting on the mature fruit.

BACCAUREA Lour.

B. lanceolata (Miq.) Muell. Arg. in DC. Prodr. 15² (1862) 457.

Hedycarpus lanceolatus Miq. Fl. Ind. Bat. 1² (1859) 359.

PALAWAN, San Antonio Bay, *Merrill 853*, February, 1903.

Java and Borneo.

The above specimen has somewhat larger leaves than the plants described by Muller-Arg., but seems to be the same species. New to the Philippines.

BLACHIA Baill.

Blachia philippinensis sp. nov.

Arbor glabra, monoica, circiter 5 m alta; foliis alternis, chartaceis vel submembranaceis, oblongo-ovatis, usque ad 13 cm longis, acuminatis, basi acutis vel obtusis, nervis utrinque circiter 6; floribus umbellatis, umbellis axillaribus terminalibusque; petalis obovatis, hyalinis et glandulis aequilongis; staminibus 20, liberis; stylis revolutis.

A glabrous monoecious tree about 5 m high. Branches slender, terete, brownish, the branchlets reddish-brown. Leaves alternate, chartaceous or submembranaceous, oblong-ovate, 7 to 13 cm long, 2.5 to 4.5 cm wide, brown or greenish when dry, shining, the apex rather prominently acuminate, the base acute or obtuse; nerves about 6 on each side of the midrib, the reticulations lax; petioles 5 mm long or less. Inflorescence axillary and terminal, the staminate umbels long-peduncled, the peduncles slender, 2 to 3 cm long, each bearing about 12 flowers, the pedicels about 8 mm long. Sepals 5, obovate to elliptic-obovate, 2 mm long, thin, obtuse, imbricate. Petals 5, hyaline, obovate, 1 mm long, broadly rounded at the apex or slightly retuse, not longer than the disk-glands. Stamens 20; filaments 2 mm long, slender; anthers obovoid, 0.3 mm long. Disk-glands quadrangular, truncate. Pistillate flowers in subsessile umbels at the base of the staminate inflorescence. Sepals 5, free, lanceolate, somewhat acuminate, 2 mm long, more or less accrescent. Ovary narrow, subglabrous, 3-celled, each cell 1-ovuled; styles three, elongated, cleft, the style-arms revolute.

PALAWAN, near Puerto Princesa, *For. Bur. 4128 Curran*, April, 1906. LUZON, Province of Pangasinan, *For. Bur. 8369 Curran & Merritt*, December, 1907: Province of Ilocos Norte, Cape Bojeador, *For. Bur. 13829 Merritt & Darling*, November, 1908.

The first representative of the genus to be found in the Philippines, and apparently distinct from all previously described forms.

CROTON Linn.

Croton argyratus Blume Bidjdr. (1825) 602; Muell. Arg. in DC. Prodr. 15² (1862) 526.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9421 Whitford & Hutchinson,* February, 1908, in dipterocarp forests at 300 m altitude.

Burma to the Malay Peninsula, Java, Sumatra, and Borneo; new to the Philippines.

Croton ardisioides Hook. f. Fl. Brit. Ind. 5 (1887) 393.

PALAWAN, *For. Bur. 3831, 4159 Curran, Bur. Sci. 857 Foxworthy,* March and May, 1906.

Malay Peninsula and Borneo; new to the Philippines.

DIMORPHOCALYX Thwaites.

Dimorphocalyx denticulatus sp. nov.

Arbor parva, monoica, glabra; foliis oblongo-lanceolatis vel lanceolatis, utrinque angustatis, apice tenuiter gradatim acuminatis, usque ad 15 cm longis, margine glanduloso-denticulatis; inflorescentiis axillaribus, masculinis cymosis, cymis brevibus, congestis, floribus femineis solitariis vel fasciculatis, petalis sepalis brevioribus.

A small glabrous monoecious tree. Branches grayish-brown, terete, slender. Leaves alternate, firmly chartaceous or subcoriaceous, oblong-lanceolate to lanceolate, narrowed at both ends, 7 to 15 cm long, 2 to 4 cm wide, the apex gradually and slenderly acuminate, the base acute, the margins rather distantly and irregularly glandular-denticulate, grayish-brown when dry, shining; nerves 10 or 11 on each side of the midrib, spreading, anastomosing and forming a distinct, submarginal nerve, the secondary nerves rather distinct, the reticulations lax, obscure; petioles 2 to 3 mm long. Staminate inflorescence axillary, of short, dense, 1 to 2 cm long cymes, each subtended by two ovate-lanceolate, acuminate, 3.5 mm long bracts. Male flowers short-pedicelled. Calyx-lobes 5, elliptic, obtuse, imbricate, about 1.5 mm long. Petals elliptic, obtuse, glabrous, 3 mm long. Stamens about 15, the outer 5 larger than the others, the filaments short, the inner ones more or less united. Pistillate flowers on the same plant, axillary, solitary or fascicled, stipitate, and subtended by several, imbricate, ovate-lanceolate, acute or acuminate bracteoles. Calyx somewhat urceolate, the lobes elliptic, 6 mm long, 3 mm wide, obtuse, in bud much exceeding the petals. Petals, in bud, imbricate, glabrous, elliptic, 3 mm long, obtuse. Ovary ellipsoid or ovoid, obscurely 3-sulcate, glabrous, 3-celled, each cell 1-ovuled; styles 3, more or less united below, cleft, in bud recurved.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9033 Whitford & Hutchinson,* December, 1907, in dipterocarp forests at an altitude of about 30 m.

A species well characterized by its glandular-denticulate leaves.

EVERETTIODENDRON gen. nov.

Flores dioici, apetali. Discus nullus. Fl. ♂ : Sepala 4, valvata Petala 0. Stamina 4, filamentia subnullis; antherae erectae, basifixae, minutae, subglobosae, loculis longitudinaliter dehiscentibus. Ovarii rudimentum 0. Fl. ♀ : Ovarium 3-loculare, ovula in loculis geminata, angulo centrali loculorum affixa, collateralia, raphe ventrali; styli 3, erecti patentes vel curvati, incrassati, integri, a basi papilloso-stigmatosi. Fructus ovoideus vel depresso-globosus, exocarpio suberoso, endocarpio duro, fere osseo, 3-loculari, loculicide 3-valvato. Arbor ramulis inflorescentiis ovarioque dense ferrugineo-pubescentibus. Folia alterna, longe petiolata, penninervia, integra, coriacea. Inflorescentia axillaria, flores ♀ numerosi, paniculati, bracteolati, ♂ solitarii vel (?) racemosi, pauci.

Everettiodendron philippinense sp. nov.

Arbor 15 ad 20 m alta; foliis alternis, coriaceis, oblong-ovatis vel oblongo-lanceolatis, integris, coriaceis, usque ad 18 cm longis, in sicco brunneis, nitidis, glabris vel subtus ad nervos parce pubescentibus, nervis utrinque 5 ad 7, distinctis, ascendentibus, anastomosantibus, reticulis laxis; petiolo 2 ad 5 cm longo; floribus masculinis in paniculis angustis axillaribus dispositis, minutis, 4-meris, bracteolatis, congestis, dense ferrugineo-pubescentibus; floribus femineis ignotis, ut videtur solitariis vel breviter racemosis, ex fructibus immaturis ovario dense ferrugineo-pubescenti, 3-loculari, loculis 2-ovulatis; fructibus axillaribus, solitariis, ovoideis vel depresso-globosis, circiter 3 cm diametro.

A tree 15 to 20 m high, the young branches and inflorescence densely ferruginous-pubescent. Branches terete, brown or reddish-brown, glabrous. Leaves alternate, coriaceous, oblong-ovate to oblong-lanceolate, entire, coriaceous, 9 to 18 cm long, 4.5 to 8 cm wide, brown and shining when dry, entire, glabrous or somewhat pubescent on the midrib and lateral nerves beneath, the apex usually prominently and sharply acuminate, the acumen sometimes subfalcate, the base acute, rarely somewhat rounded; nerves 5 to 7 on each side of the midrib, prominent beneath, ascending, slightly curved, anastomosing near the margin, the reticulations lax; petioles often ferruginous-pubescent ultimately subglabrous, 3 to 5 cm long, slightly thickened at the apex and sometimes a little geniculate. Staminate inflorescence in the upper axils, of narrow, 3 to 5 cm long, racemose panicles, all parts of it densely ferruginous-pubescent, the branches short, each one subtended by an ovate bract about 3 mm long, the flowers minute, sessile, congested, subtended by bracteoles similar to but smaller than the bracts. Sepals 4, free, valvate, acute or slightly acuminate, ovate, pubescent, 2 mm long. Petals none. Stamens 4, in the center of the flower, with no staminodes and no disk; filaments very short or subobsolete; anthers globose, basifixed, minute, about 0.2 mm in

diameter, 2-celled, apparently longitudinally dehiscent. Rudimentary ovary none. Pistillate flowers unknown, but from the fruiting specimens axillary, solitary or (?) shortly racemose, the sepals from immature fruits lanceolate, acuminate, densely pubescent, 7 mm long, deciduous. Ovary ovoid, densely pubescent, 3-celled, each cell with two pendulous ovules in the upper inner angle; styles 3, simple, free or slightly united at the base, erect, spreading or incurved, thickened, their backs ferruginous-pubescent, their inner surfaces papillose-stigmatose from base to apex. Fruit, when young, ovoid, densely pubescent, when nearly mature depressed-globose, glabrous or nearly so, 3 cm in diameter, the exocarp corky, the endocarp hard, almost bone-like in texture, 3-celled, loculicidally 3-valved; seeds (immature) ellipsoid-ovoid, glabrous.

NEGROS, Himugaan River, *For. Bur. 7282 Everett*, May 22, 1907, with staminate flowers, in dense forests at 60 m altitude; same locality, *For. Bur. 7316 Everett*, March, 1907, sterile. LUZON, Province of Pangasinan, Salasa, *For. Bur. 9633 Zschokke*, December, 1907, in forested stream-depressions, sterile: Province of Zambales, Bolet River, near Santa Cruz, *For. Bur. 8230 Curran & Merritt*, December 4, 1907, with immature fruits, on forested slopes at an altitude of 270 m: Province of Cagayan, Calamaniugan, *For. Bur. 11311 Klemme*, November 14, 1907, with nearly mature fruits, in forests at 15 m altitude. Local names, Pangasinan *Ebnel;* Cagayan *Maraculilem*.

Mr. Zschokke notes that the tree is cut for lumber; Messrs. Curran & Merritt that the tree has a very thin brick-red bark which is red inside, and that the tree is subject to heart-decay, while the native ranger accompanying Mr. Klemme states that the fruit is used as a condiment in the preparation of food.

The affinities of this new genus are not clear to me, although following Bentham and Hooker, and Pax in Engler and Prantl, it apparently falls in the *Phyllantheae* of the former, and in the *Platylobeae-Phyllanthoideae-Brideliae* of the latter, except in the latter case the petals are wanting, and moreover the present genus does not resemble any of those placed here by Pax. The sepals are not in the least imbricate, so far as I can determine, but assuming that they are slightly so, or that the above form is anomalous in this respect, it would then fall into the *Platylobeae-Phyllanthoideae-Phyllanthineae*, and under this into the *Drypetinae*, near *Putranjiva* Wall., and *Petalostigma* F. Müll.; it is however very different from both these genera, although its affinity may be here. There is a possibility that it does not really belong in the *Euphorbiaceae*, but I have been unable to place it elsewhere.

The above new genus is dedicated to Mr. H. D. Everett, one of the collectors, and formerly a forester in the Philippine Forestry Bureau, who lost his life at the hands of members of the wild tribe inhabiting the interior of southern Negros, while prosecuting field work there in May, 1908.

GALEARIA Zoll. & Mor.

Galearia filiformis (Blume) Boerl. Handl. Fl. Nederl. Ind. 3^1 (1899) 282.
Antidesma filiforme Blume Bijdr. (1826) 1124.
Bennettia filiformis Muell. Arg. in DC. Prodr. 15^2 (1862) 1038.
Bennettia javanica R. Br. Pl. Jav. Rar. (1852) 249, *pl. 50.*
MINDANAO, Lake Lanao, *Mres. Clemens s. n.* May, June, 1906–7.

The Mindanao specimens do not agree perfectly with *Galearia filiformis* as described by Robert Brown and Mueller-Arg., but in the absence of authentic material for comparison, I can do no better, at the present time, than refer them here. The chief point of difference seems to be that the petals of the Philippine specimens are not strongly cucullate. Hooker f.[7] states that the sections founded by Mueller-Arg. on the hooded petals are not tenable. The genus is new to the Philippines.

Java.

GELONIUM Roxb.

Gelonium racemulosum sp. nov.

Arbuscula glabra circiter 1 m alta; foliis oblongis vel lanceolate-oblongis, pallidis, nitidis, glanduloso-punctatis, usque ad 20 cm longis, versus apicem grosse irregulariter repando-dentatis, basi acutis vel acuminatis; inflorescentiis masculinis oppositifoliis, racemulis binis, paucifloris, brevibus, petiolo vix longioribus; sepalis obtusis, plus minus cucullatis; staminibus circiter 16; fructibus depresso-globosis, circiter 1 cm diametro, plus minus trigonis, loculicide dehiscentibus.

A shrub or undershrub about 1 m high, glabrous throughout. Branches grayish, slender, the ultimate ones slightly angled. Leaves alternate, glabrous, pale when dry, glandular-punctate, shining, oblong to lanceolate-oblong, 9 to 20 cm long, 2.5 to 4 cm wide, chartaceous, the apex acuminate, the apical portion very coarsely and irregularly repand-dentate, otherwise entire, the base acute or slightly acuminate; nerves about 12 on each side of the midrib, anastomosing, the reticulations distinct; petioles stout, 3 to 4 mm long. Staminate flowers racemose, leaf-opposed, the racemes in pairs, scarcely as long as the petioles, few-flowered, flowering from the base to the apex, the lower flowers opening first and falling, so that there is usually but two or three flowers on a raceme, the rachis slender, the pedicel-scars prominent. Sepals elliptic or elliptic-ovate, obtuse, 3 mm long, 2 mm wide, more or less cucullate, imbricate. Stamens about 16; filaments free, 2 mm long; anthers oblong, 0.8 mm long. Disk-glands small. Rudimentary ovary none. Pistillate flowers unknown, but the calyx, from the fruit, as in the staminate ones. Fruit depressed-globose, glabrous, about 1 cm in diameter, obtusely trigonous, 3-celled, loculicidally 3-valved, each cell 1-seeded; styles persistent, free, each shortly cleft, the arms very short, recurved.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9260, 9349 Whitford & Hutchinson*, January, 1908, in dipterocarp forests 20 to 30 m above sea level.

A species well characterized by its leaves being coarsely repand in the apical portion, and especially by its paired, short racemes, the staminate flowers of most species of the genus being glomerate.

[7] Fl. Brit. Ind. **5** (1887) 377.

HOMALANTHUS A. Juss.

Homalanthus bicolor sp. nov.

Arbuscula glabra, circiter 2 m alta; foliis longissime petiolatis, cordato-ovatis, breviter acuminatis, basi latis, leviter cordatis, interdum leviter peltatis, glabris, chartaceis, supra olivaceis, subtus glauco-pallidis, nervis utrinque 11 ad 15, petiolo 8 ad 20 cm longo; floribus ignotis; fructibus in racemis congestis, obovoideis vel obovoideo-orbicularibus, compressis, griseo-brunneis, loculicide 2-valvatis.

A glabrous shrub about 2 m high. Young branches dark-brown, glabrous. Leaves alternate, very long-petioled, cordate-ovate or subor-bicular-ovate, the base broad, cordate, the apex shortly acuminate, entire, 7 to 13 cm long and nearly as wide, chartaceous, glabrous, the upper surface olivaceous, the lower very pale, subglaucescent; petiole 8 to 20 cm long, glabrous, with two more or less prominent glands at the apex, sometimes peltately inserted about 5 mm from the margin of the leaf, more often marginally inserted; stipules caducous, thin, brown, lanceo-late, sharply acuminate, about 7 cm long. Flowers unknown. Fruit crowded, racemose, the racemes about 4 cm long; pedicels spreading or somewhat reflexed, about 8 mm long; fruit obovoid or orbicular-obovoid, compressed, about 8 mm long, grayish-brown, 2-celled compressed at right angles to the dehiscence, loculicidally 2-valved, crowned by the style which is nearly as long, and which is cleft nearly to the base.

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4722 Mearns & Hutchinson*, altitude about 350 m. Moro *Topi*.

A species allied to *Homalanthus populneus* Pax, and to *H. fastuosus* F.-Vil., and somewhat intermediate between the two, distinguishable from the former by its much larger leaves and larger fruits, and from the latter by its non- or but slightly peltate leaves.

MACARANGA Thouars.

Macaranga congestiflora sp. nov. § *Pachystemon*.

Arbor parva circiter 4 m alta; foliis suborbicularibus, subintegris vel leviter trilobatis, apice breviter acuminatis, basi late peltatis, supra nitidis, subtus parce hirsutis, glandulosis, radiato 8-nerviis; petiolo 10 ad 15 cm longo; inflorescentiis axillaribus caulinisque, 1 ad 3 cm longis, femineis racemosis, masculinis breviter racemoso-paniculatis, congestis, bracteis pectinato-laciniatis, ceraceo-glandulosis, pubescentibus; ovario 2–4-loc-ulare.

A small tree about 4 m high. Branches dark-brown, glabrous or more or less pubescent, the young branchlets slightly brownish-pubescent. Leaves alternate, long-petiolate, broadly peltate, suborbicular, subentire or slightly and broadly 3-lobed, the apex slightly acuminate, base rounded, 10 to 20 cm in diameter, subcoriaceous, rather pale when dry, the upper surface glabrous, shining, the lower somewhat hirsute, especially on the nerves, and with numerous scattered waxy glands; nerves radiate, the

basal ones 8, prominent; nerves leaving the midrib above the base about 6 on each side, the reticulations distinct; petioles 10 to 15 cm long, terete, pubescent. Inflorescence axillary and from the stems below the leaves, the staminate fasciculate, dense, of very short racemose panicles 2 cm long or less, their branches 1 cm long or less, gray-pubescent; bracteoles cuneate, pubescent, yellow-glandular, about 5 mm long, lacerate-pectinate; stamens few: pistillate inflorescence axillary and from the axils below the leaves, racemose, usually solitary 3 cm long or less, pubescent, each raceme few-flowered; pedicels stout, pubescent, 2 mm long; calyx pubescent, cup-shaped, truncate, about 2.5 mm long; ovary globose, densely yellowish waxy-glandular, 2- to 4-celled; styles recurved, more or less pectinate; bracts ovate or ovate-lanceolate, lacerate-pectinate, more or less pubescent, 6 to 8 mm long.

PALAWAN, near Puerto Princesa, *For. Bur. 3590, 3591 Curran,* January, 1906, in old clearings at about 20 m above sea level, the former with staminate flowers, the latter with pistillate ones.

This species probably belongs in the section *Pachystemon,* although 2-, 3-, and 4-celled ovaries were found on the same plant. It is well characterized by its suborbicular, nearly entire or slightly 3-lobed leaves, and especially by its short, congested, axillary and cauline inflorescences, the staminate being paniculate, and the pistillate racemose.

MALLOTUS Lour.

Mallotus korthalsii Muell. Arg. in DC. Prodr. 15² (1862) 976.

LUZON, Province of Cagayan, Aparri, *For. Bur. 17072 Curran,* February, 1909. MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9017 Whitford & Hutchinson,* November, 1907.

New to the Philippines; previously known only from Borneo and Celebes.

MICRODESMIS Planch.

Microdesmis casearíaefolia Planch. in Hook. Ic. Pl. (1844) sub. *t. 758;* Muell. Arg. in DC. Prodr. 15² (1862) 1041.

PALAWAN, near Puerto Princesa, *Bur. Sci. 249 Bermejos,* December, 1905; Mount Victoria, *For. Bur. 4138 Curran, Bur. Sci. 732 Foxworthy,* March, 1906. BALABAC, *Merrill 5380,* October, 1906.

Burma to southern China, the Malay Peninsula, and Borneo. The genus is new to the Philippines except for a single specimen collected in Palawan by Vidal and reported without specific name by Ceron;[8] Vidal's specimen in the Kew herbarium, is apparently identical with the material here referred to Planchon's species.

OSTODES Blume.

Ostodes serrato-crenata sp. nov.

Arbor subglabra 8 ad 12 m alta; foliis chartaceis vel subcoriaceis, in sicco brunneis, nitidis, oblongis vel elliptico-oblongis, usque ad 30 cm longis, basi acutis vel acuminatis, apice breviter acuminatis, margine gross irregulariter crenato-serratis, dentibus glanduliferis; nervis utrinque

[8] Cat. Pl. Herb. (Manila) (1892) 151.

circiter 17, prominentibus; inflorescentiis masculinis axillaribus vel pseudoterminalibus, elongatis, floribus in glomerulis congestis, plus minus stellato-ferrugineo-pubescentibus; staminibus circiter 12.

A subglabrous tree 8 to 12 m high. Branches light-gray or brownish-gray, glabrous, striate, lenticellate, the young branchlets ferruginous-stellate-pubescent. Leaves alternate, oblong or elliptic-oblong, 15 to 30 cm long, 6 to 13 cm wide, brownish and shining when dry, glabrous or with very few scattered stellate hairs beneath, the base acute or somewhat acuminate, the apex short-acuminate, margins coarsely and irregularly crenate-serrate, the teeth bearing glands at their apices; nerves about 17 on each side of the midrib, prominent, the primary reticulations rather distinct, the ultimate ones faint; petioles 4 to 7 cm long, glabrous or with few, scattered, stellate hairs, frequently slightly geniculate at the apex. Staminate inflorescence axillary and pseudoterminal, slender, elongated, 20 to 40 cm long, the branches few, short, the flowers densely crowded in reduced, scattered cymes, glomerate, the rachis and branches ultimately glabrous or nearly so, the younger parts more or less stellate- or furfuraceous-pubescent. Buds more or less trigonous; sepals (in bud) orbicular-ovate, obtuse, 3 mm long, strongly imbricate, the exposed portions densely stellate-pubescent. Petals similar but glabrous, and in bud somewhat smaller. Stamens about 12. Pistillate flowers and fruit unknown.

LUZON, Province of Cagayan, Aparri, *For. Bur. 11271*, April 1908; San Vicente, *For. Bur. 7078 Klemme*, May, 1907. In dense forests 20 to 65 m above sea-level, known to the Negritos as *Tagalipa* and *Aguindulong*.

The genus is new to the Philippines.

STROPHIOBLACHIA Boerl.

Strophioblachia fimbricalyx Boerl. Handl. Fl. Nederl. Ind. 3[1] (1900) 236.

PALAWAN, *For. Bur. 4504, 7458 Curran*, June, 1905, 1906, *Bur. Sci. 241 Bermejos*, near the seashore. MINDANAO, district of Zamboanga, *Mearns 114*, January, 1904.

An interesting addition to the Philippine flora, and especially to the long list of species known only from the Philippines and Celebes. A monotypic genus known previously only from Celebes.

ANACARDIACEÆ.

PLEIOGYNIUM Engl.

P. solanderi (Benth.) Engl. in DC. Monog. Phan. 4 (1883) 255.

Spondias solanderi Benth. Fl. Austral. 1 (1863) 492.

Spondias pleiogyna F. Muell. Fragm. 4:78.

LUZON, Province of Rizal, *For. Bur. 2166, 3163 Ahern's collector*, December, 1904, and June, 1905, the former, with mature fruits, from Tanay, the latter, with staminate flowers from Antipolo.

A monotypic genus, previously known only from northern Australia, and its

discovery in Luzon is a striking addition to the list of Australian types in the Philippine flora. The Philippine form was at first considered by me to be an undescribed species, but after a careful examination of the description, and comparison with material from the Port Jackson District, Australia, coll. J. H. Camfield, December, 1907, I am at loss to discover any character by which the Philippine plant can be distinguished from the Australian except the unscientific one of geographical distribution. It is possible that a revision of the genus will lead to the characterization of more than one species, for Bentham, in the original description, states that it is quite glabrous in all of its parts, while Engler describes the young branches and leaves as densely pilose, the Philippine specimens and the one Australian specimen before me agreeing with the latter.

ACERACEÆ.

ACER Linn.

Acer curranii sp. nov. § *Integrifolia.*

Arbor glabra usque ad 25 m alta; foliis concoloribus, nitidis, glabris, integris, coriaceis, reticulatis, ovatis vel elliptico-ovatis, breviter obtuse acuminatis, basi rotundatis vel obtusis, 3- vel 5-nerviis, usque ad 13 cm longis; floribus masculinis corymbosis, corymbis axillaribus, brevibus, glabris; fructibus 4 cm longis, alis angulo acuto divergentibus, paullo introssum falcatis.

A glabrous tree 25 m high or less, the trunk reaching a diameter of 110 cm. Branches terete, smooth, glabrous, reddish-brown, with few scattered lenticels. Leaves ovate to elliptic-ovate, coriaceous or subcoriaceous, shining, glabrous, of the same color on both surfaces, distinctly reticulate, 9 to 13 cm long, 5 to 6.5 cm wide, entire, the apex shortly and obtusely acuminate, the base usually broad and rounded, sometimes blunt, rarely acute; basal nerves one or two pairs, the outer pair, when present, short, the lateral nerves above the basal ones usually 4 on each side of the midrib, distant, very prominent, the primary reticulations very prominent, rather lax, the ultimate ones fine; petioles 2 to 5 cm long. Male inflorescence axillary, corymbose, about 2 cm long, glabrous, the branches few, short; pedicels 2 to 5 mm long. Sepals 4, free, oblong-ovate, 2 to 3.5 mm long, about 2 mm wide. Petals 4, similar to the sepals but narrower. Stamens 4 or 5, inserted in the disk on its outer side; filaments 2 to 3 mm long; anthers about 1 mm in length. Disk lobed, fleshy, glabrous, very thick; bracts subtending the inflorescence numerous, ovate, coriaceous, closely imbricated, 3 mm long, their upper margins pubescent, deciduous, leaving a thickened, rough base to the inflorescence 2 to 3 mm long and 2 thick, strongly and densely marked by the bract-scars. Pistillate flowers unkown. Infrutescence corymbose, 10 cm long or less, glabrous, with few branches, the fruit, including the wing, 4 cm long, the wings diverging at an acute angle, slightly falcate, 10 to 13 mm wide.

LUZON, Province of Bataan, Mount Mariveles, *For. Bur. 6254 Curran*, February, 1907, with nearly mature fruit, in forests at an altitude of about 550 m (type): Province of Benguet, Mount Ugo, *Bur. Sci. 5708 Ramos*, December, 1908, staminate flowers: Province of Abra, Tue, *For. Bur. 14582 Darling*, February, 1909, sterile, altitude 1,000 m. Known to the Igorots in Abra as *Baleag*.

A species manifestly allied to the Asiatic *Acer laevigatum* Wall., but with different leaves which are usually broad and rounded at the base, and with 4-merous staminate flowers. It is quite different from the only other species of the genus known from the Philippines, *A. philippinum* Merr., that species having the leaves very glaucous beneath, and the staminate inflorescence racemose. The latter species is a shrub or small tree, while the present one is a large tree.

A third species is possibly represented by sterile material, *For. Bur. 10948 Curran*, Mount Data, District of Lepanto, Luzon, the young leaves being densely tomentose beneath.

SABIACEÆ.

MELIOSMA Blume.

Meliosma monophylla sp. nov.

Arbor parva; foliis simplicibus, alternis, oblanceolatis, integris, brunneis, nitidis, usque ad 35 cm longis, 7 cm latis, apice acuminatis, basi sensim decurrento-acuminatis; nervis utrinque circiter 20, prominentibus, ascendentibus, anastomosantibus; paniculis terminalibus axillaribusque, dense ferrugineo-pubescentibus, 15 ad 20 cm longis; floribus numerosis, minutis, ad apices ramulorum congestis.

A small tree, more or less ferruginous-pubescent. Branches terete, lenticellate, somewhat ferrugineous-pubescent. Leaves simple, oblanceolate, 20 to 35 m long, 5 to 7 cm wide, subcoriaceous, brownish when dry, shining, entire or with few irregular and obscure teeth above, the apex acuminate, the base long and slenderly decurrent-acuminate, glabrous on the upper surface, except on the somewhat pubescent midrib, beneath with scattered hairs especially on the midrib and lateral nerves; nerves about 20, prominent, ascending, anastomosing, the reticulations distinct; petioles pubescent, 2 to 2.5 cm long. Panicles terminal and in the upper axils, 15 to 20 cm long, densely ferruginous-pubescent, the lower branches spreading. Flowers small, crowded on the ultimate branchlets, sessile, the bracts more or less pubescent. Outer three petals orbicular, 1.5 to 1.8 mm long, the inner two linear, cleft, about 1 mm long. Stamens 2, about 1 mm long. Ovary compressed, glabrous, 2-celled, the style short, simple.

LUZON, Province of Rizal, Tanay, *Merrill 2339*, May, 1903; Antipolo, *For. Bur. 431 Ahern's collector*, February, 1904; Montalban, *For. Bur. 3406 Ahern's collector*, November, 1905, distributed as *Semecarpus perrottetii* March, which they remotely resemble. T., *Malaligas*.

The first simple leaved form to be found in the Philippines, manifestly allied to *Meliosma lancifolia* Hook. f., of the Malay Peninsula, but apparently sufficiently distinct.

RHAMNACEÆ.

VENTILAGO Gaertn.

Ventilago dichotoma (Blanco) Merr. in Govt. Lab. Publ. (Philip.) 27 (1905) 32, excl. syn. *V. luzoniensis* Vid.

Enrila dichotoma Blanco Fl. Filip. (1837) 709.

Ventilago monoica Blanco l. c. ed. 2 (1845) 124; ed. 3, 1:223.

Ventilago maderaspatana F.-Vill. Nov. App. (1880) 48, ex syn. Blanco, non Gaertn.

Kurrimia gracilis Vid. Rev. Pl. Vasc. Filip. (1886) 89.

Ventilago gracilis Merr. & Rolfe in Philip. Journ. Sci. 3 (1908) Bot. 110.

LUZON, Province of Rizal, San Mateo, *Vidal 1122* in Herb. Kew., type of *Kurrimia gracilis* Vid.; Bosoboso, *For. Bur. 3073 Ahern's collector*, May, 1905, in flower; Pilea, *Bur. Sci. 3303 Ramos*, June, 1907, in fruit; Montalban, *Loher 4685, 4686*, in Herb. Kew. sub *Galearia*.

Endemic.

The type of Blanco's new genus and species, *Enrila dichotoma*, was from San Mateo, Province of Rizal, Luzon, and all the above specimens are from the same province, and agree with his description. The genus *Enrila* was placed by Bentham in the *Anacardiaceae*, as a doubtful one, but Blanco properly localized it, in the second edition of his Flora de Filipinas, although in reducing *Enrila* to *Ventilago*, he changed the specific name. It was reduced by F.-Villar to *Ventilago maderaspatana* Gaertn., which is certainly an error. Having only flowering specimens, Vidal redescribed the species as *Kurrimia gracilis*, of the *Celastraceae*, but failed to connect Blanco's species with it, and later in looking over Vidal's specimens in the Kew Herbarium, Mr. Rolfe and myself found Vidal's type to be a *Ventilago*, rather than a *Kurrimia*, and accordingly transferred the species to the former genus. In making the original transfer of *Ventilago dichotoma*, I cited as a synonym, *Ventilago luzoniensis* Vid., but this is an error, as an examination of Vidal's type shows that this species is quite distinct from the one here considered, and one to which Blanco's description does not apply.

Ventilago oblongifolia Blume Bijdr. (1826) 1144; Miq. Fl. Ind. Bat. 1^1 (1855) 640.

PALAWAN, Puerto Princesa, *Bur. Sci. 264 Bermejos*, December, 1905. LUZON, Province of Bulacan, near Norzagaray, *Yoder 105*, December, 1906.

New to the Philippines; previously reported only from Java.

Ventilago luzoniensis Vid. Rev. Pl. Vasc. Filip. (1886) 90.

V. maderaspatana Vid. Sinopsis Atlas (1883) *t. 32, f. D.*, non Gaertn.

LUZON, Province of Tarlac, La Paz, *Vidal 198*, in Herb. Kew.

This endemic species somewhat resembles the preceding one, but is distinguishable by its much smaller leaves.

Ventilago lucens Miq. Fl. Ind. Bat. Suppl. (1860) 330.

LUZON, Province of Tayabas (Principe), Baler, *Merrill 1105*, August, 1902.

This species has previously not been reported from the Philippines, but so far as I can determine at present the specimens well represent Miquel's species, although I have not seen the type. King[9] states that *Ventilago lucens* Miq. must be very near, if not identical with *V. leiocarpa* Benth., but the specimen above referred to *V. lucens* Miq., is quite distinct from material in our herbarium from Hongkong and from Singapore, supposedly representing Bentham's species.

Sumatra.

[9] Journ. As. Soc. Beng. 65^2 (1896) 380.

ZIZYPHUS Juss.

Zizyphus hutchinsonii sp. nov.

Arbor glabra vel subglabra, inermis; foliis coriaceis vel subcoriaceis, ovatis vel oblongo-ovatis, acuminatis, minute crenulatis, basi valde inaequilateralibus, supra nitidis, subtus plus minus glaucis, trinerviis, reticulis tenuibus, obscuris; fructibus globosis, circiter 1.5 cm diametro, carnosis, glabris, in sicco nigris.

A tree 15 to 25 m high, glabrous or nearly so throughout, spineless. Branches terete, slender, minutely lenticellate, black or nearly so when dry, glabrous, the growing parts sometimes slightly pubescent. Leaves ovate to oblong-ovate, coriaceous or subcoriaceous, 7 to 11 cm long, 3 to 5 cm wide, glabrous, the upper surface greenish or brownish when dry, shining, the lower surface more or less glaucous, the margins minutely crenulate, the apex slightly acuminate, acumen obtuse or acute, the base strongly inequilateral, rounded on both sides of the midrib, or rounded on one side and acute on the other; nerves three, prominent, the nervules and reticulations very fine, obscure, more prominent on the upper surface than on the lower; petioles 6 to 8 mm long, sometimes slightly pubescent. Flowers unknown. Fruits globose, glabrous, black and shining when dry, about 1.5 cm in diameter, the pericarp fleshy, the stone bony, two- or three-celled; seeds brown, shining, compressed, 5 mm long.

BASILAN, Matangal Point, *For. Bur. 3444 Hutchinson*, December, 1905, in forests at about 10 m altitude, said to be abundant locally and known to the Yacans as *Toncud langit*. It is also represented by *For. Bur. 9265 Whitford & Hutchinson*, from Port Banga, District of Zamboanga, Mindanao, January, 1908.

ELAEOCARPACEÆ.

ELAEOCARPUS Linn.

Elaeocarpus curranii sp. nov. § *Dicera*.

Arbor 15 ad 30 m alta, ramulis inflorescentiisque exceptis, glabra; foliis anguste obovatis vel oblongo-obovatis, usque ad 10 cm longis, apice obtuse acuminatis apiculatisque, basi cuneatis, margine valde crenato-serratis; racemis numerosis e axillis defoliatis, folia subaequantibus vel brevioribus; petalis laceratis, basi agustatis, subglabris; staminibus circiter 12, cellulis antherae aequalibus obtusis; ovario glabro; fructibus ellipsoideis, circiter 2 cm longis, 1-locellatis.

A tree 15 to 30 m high glabrous or nearly so except the young branchlets and inflorescence. Branches terete, gray or brown, lenticellate, the young branchlets, as well as the petioles and sometimes the young leaves appressed-pubescent, obovate, rarely oblanceolate, 5 to 10 cm long, 1.5 to 4 cm wide, firmly chartaceous to subcoriaceous, usually brownish and somewhat shining when dry, the apex acuminate, acumen usually short, blunt, apiculate, sometimes minutely retuse, the base narrowed, cuneate, the margins strongly crenate-serrate, when young sometimes slightly

hairy, ultimately glabrous; nerves 6 on each side of the midrib, distinct, spreading-ascending, slightly curved, their axils not glandular, the reticulations indistinct; petioles 1 to 2 cm long, when young pubescent, ultimately glabrous. Racemes numerous, 5 to 7 cm long, on the branches below the leaves, the rachis and pedicels more or less pubescent, in fruit becoming quite glabrous; pedicels about 5 mm long. Sepals lanceolate, acuminate, 5 mm long, 1.2 mm wide, with very few scattered hairs on the back or glabrous, the margins densely pubescent. Petals as long as the sepals, the upper one-third or one-half lacerate, base narrowed, glabrous or with few scattered hairs on the back and especially at the base. Stamens about 12; anthers 1.8 mm long, cells equal, blunt, not apiculate or ciliate. Ovary ovoid, glabrous, 3-celled; style 2 mm long, glabrous. Disk pubescent. Fruit ellipsoid about 2 cm long, 1-celled, the endocarp osseous, rugose.

Luzon, Province of Cagayan, Aparri, *For. Bur. 11314 Klemme*, in flower, April, 1908; Province of Zambales, Subic, *For. Bur. 847,918 Maule*, April, June, 1904, in fruit: Province of Bataan, Lamao, *For. Bur. 7506 Curran*, September, 1907, in flower: Province of Tayabas, Lagumanoc, *For. Bur. 4 Ware*, in flower, September, 1903, (type): Province of Camarines, Sipocot, *For. Bur. 705 Van Wickle*, May, 1904, in fruit. Local names, Cagayan *Cumao;* Zambales *Tagatoy, Malacadios;* Tayabas *Camaysahan;* Camarines *Maloc-maloc.*

A species allied to *Elaeocarpus cumingii* Turcz. but readily distinguished by its glabrous ovaries and vegetative characters.

Elaeocarpus luzonicus sp. nov. § *Monocera.*

Arbor circiter 15 m alta, glabra, racemis exceptis; foliis subcoriaceis, oblongo-lanceolatis, usque ad 7 cm longis, nitidis, apice acuminatis, basi cuneatis, margine crenatis, subtus in axillis glandulosis; racemis axillaribus, pubescentibus, folia aequantibus vel longioribus; petalis oblongo-obovatis, supra simpliciter fimbriatis, extus leviter argenteo-pubescentibus; staminibus circiter 24, cellulis antherae inaequalibus, posticis apiculatis, vix ciliatis; ovarium 2-loculare.

A tree about 15 m high, glabrous throughout except the inflorescence. Branches terete, brown or grayish, not or but obscurely lenticellate. Leaves subcoriaceous oblong-lanceolate, or sometimes elliptic-lanceolate, 5 to 7 cm long, 1.5 to 3 cm wide, shining, beneath sometimes subglaucous, the apex shortly, or sometimes rather long-acuminate, acumen obtuse, base cuneate, margins crenate; nerves about 6 on each side of the midrib, distinct, the axils beneath mostly prominently glandular; petioles 1 to 1.4 cm long. Racemes axillary, solitary, 6 to 8 cm long, the rachis and pedicels appressed-pubescent with pale, often shining hairs, the pedicels 5 to 6 mm long. Sepals lanceolate, 5 to 6 mm long, 1.5 mm wide, thin, sparingly appressed-silvery-pubescent outside, the keel within, and the margins white-villous. Petals thin, oblong-oboyate the upper one-third simply fimbriate, 6 to 7 mm long, the back appressed-silvery-pubescent, the margins and lower part of the inner surface white-villous. Stamens about 24; anthers scabrid, 2 to 2.5 mm long, one cell slightly longer than

the other, apiculate, not ciliate. Ovary pubescent, ovoid, 2-celled; style glabrous, about 5 mm long. Disk pubescent.

LUZON, Province of Camarines, Mount Isarog, *For. Bur. 10488 Curran*, May, 1908, in forests at about 1,000 m altitude. A specimen collected by Rosenbluth, *For. Bur. 12220*, from either Mindoro or Lubang is possibly referable here, but it has more strongly acuminate leaves, and no axillary glands.

Probably most closely allied to *Elaeocarpus multiflorus* (Turcz.) F.-Vill., but quite distinct from that species.

Elaeocarpus subglobosus sp. nov. § *Ganitrus*.

Arbor 10 ad 20 m alta glabra, partibus junioribus inflorescentiisque exceptis; foliis oblongis, firmiter chartaceis, usque ad 12 cm longis, apice breviter obtuseque acuminatis, basi acutis, margine leviter crenatis, nervis utrinque 10 ad 12; racemis axillaribus, pubescentibus, foliis multo brevioribus; floribus 5-meris, petalis laciniatis; staminibus circiter 25; ovario 5-loculare; fructibus subglobosis 5- vel 4-locellatis, circiter 12 mm diametro.

A tree 10 to 20 m high. Branches terete, dark-grayish-brown, glabrous, the younger branchlets, petioles and young leaves rather densely pubescent with appressed, pale, often shining hairs. Leaves oblong, firmly chartaceous, 7 to 12 cm long, 3 to 4.5 cm wide, not or but slightly shining, glabrous except the very youngest ones, apex shortly and obtusely acuminate, base acute, margins slightly crenate; nerves, 10 to 12 on each side of the midrib, distinct, forked, obscurely anastomosing, the axils of the primary nerves and of the larger reticulations glandular; petioles 1 to 2 cm long, at first appressed-pubescent, ultimately glabrous. Racemes axillary, solitary, 2 to 4 cm long, appressed-pubescent, the pedicels about 5 mm. long. Sepals 5, lanceolate, acuminate, 6 mm. long, 1.5 mm wide, pubescent outside, keeled within. Petals as long as the sepals, lacinate to the middle, slightly hairy on the margins below. Stamens about 25; anthers linear, scabrid, one cell slightly longer than the other and ciliate at its apex. Ovary ovoid, pubescent, 5-celled; style 5 mm long, glabrous. Fruits purple, globose to obscurely globose-ellipsoid, about 12 mm in diameter, 5-rarely 4-celled, the endocarp bony.

LUZON, Province of Benguet, Baguio, *For. Bur. 18317 Alvarez*, December, 1908; *Williams 1036*, October, 1904.

Allied to *Elaeocarpus sphaericus* (Gaertn.) K. Sch., but quite distinct.

MALVACEÆ.

KOSTELETZKYA Presl.

Kosteletzkya batacensis (Blanco) F.-Vill. Nov. App. (1880) 24.

Hibiscus batacensis Blanco Fl. Filip. (1837) 544, ed. 2 (1845) 380, ed. 3, 2:334.

LUZON, Province of Ilocos Norte, *Bur. Sci. 3315 Mearns*, January, 1907: Province of Rizal, Pasay, *F. de la Llana*, February, 1908, Normal School distribution *327*.

The rediscovery of *Hibiscus batacensis* is considered worthy of record, as the species has not otherwise been collected since Blanco's time. F.-Villar gives a

description in Latin, taken entirely from Blanco's original description, and states that he had seen no specimens. An examination of Blanco's description shows that it applies unmistakably to *Kosteletzkya*, and F.-Villar was quite correct in making the transfer to the latter genus. On studying the above specimens, I found that they agreed with none of the descriptions of the various species of *Kosteletzkya*, other than Blanco's but thinking that the species might be an introduced one here, I sent specimens to Kew for comparison, and received the following communication: "The specimen of *Kosteletzkya batacensis* does not match any of the species in the Kew Herbarium, from America or elsewhere, and in view of the wide distribution of the genus, America, Mediterranean region, Tropical Africa and Madagascar, the existence of an endemic Philippine species is not theoretically improbable." Blanco's type was from the town of Batac, Province of Ilocos Norte, Luzon, and the species is probably endemic in the Philippines.

STERCULIACEÆ.

LEPTONYCHIA Turcz.

Leptonychia banahaensis (Elmer) comb. nov.
Grewia banahaensis Elmer Leafl. Philip. Bot. 1 (1908) 319.

Arbuscula glabra vel subglabra, circiter 3 m alta; foliis alternis, glabris vel subglabris, lanceolatis vel oblongo-lanceolatis, 7 ad 13 cm longis, nitidis, membranaceis vel submembranaceis, apice caudato-acuminatis, basi obtusis vel subrotundatis, minute glanduloso-punctatis, subtus in axillis glandulosis; nervis utrinque 5, ascendentibus, prominentibus; floribus axillaribus, solitariis, pedicellatis; petalis orbicularibus vel ovato-orbicularibus, pubescentibus, circiter 2 mm longis, liberis; staminibus 10, 5-adelphis, basi in annulo connatis; staminoideis exterioribus nullis, interioribus 5, brevibus, phalangibus alternantibus; ovario 3-loculare; fructibus ovoideis vel obovoideis, glabris, rugosis, 3- vel abortu 2- vel 1-locularibus, loculicide dehiscentibus, loculis 1-spermis; seminibus ovoideis, glabris, leviter compressis, nitidis, circiter 1.3 cm longis, arillatis.

LUZON, Province of Tayabas, Lucban, *Elmer 7569*, May, 1906, type number: Province of Laguna, Santa Maria Mavitac, *For. Bur. 10069 Curran*, February, 1908; Mabalucbaluc Pass, *Bur. Sci. 6044 Robinson*, March, 1908.

The first representative of the genus to be found in the Philippines, and erroneously described by Mr. Elmer as a *Grewia*, of the *Tilaceae*. The species strongly resembles the Malayan *Leptonychia heteroclita* (Roxb.) Kurz., but differs in the total absence of the external row of staminodes.

GUTTIFERÆ.

CALOPHYLLUM Linn.

Calophyllum auriculatum sp. nov. § *Apetalum*.

Arbor circiter 20 m alta, glabra, gemmis ferrugineo-puberulis exceptis, ramis teretibus, griseis, ramulis crassiusculis, in sicco valde angulatis sulcatisque; foliis subsessilibus vel breviter petiolatis, coriaceis, nitidis, oblongo-ellipticis vel oblongo-obovatis, apice obtusis vel rotundatis, rariter subacutis, basi distincte auriculatis. Inflorescentiis axillaribus, solitariis

vel binis, glabris, folia multo brevioribus, floribus paucis, umbellato-racemosis, longe pedicellatis; fructibus ellipsoideis vel ovoideis, circiter 2 cm longis, in sicco rugosis.

A tree about 20 m high, glabrous throughout except the terminal buds which are densely ferruginous-puberulent. Branches terete, light-gray, the branchlets stout, gray or yellowish, strongly angled and sulcate. Leaves subsessile or very shortly petioled, coriaceous, shining, oblong-elliptic to oblong-obovate, 14 to 18 cm long, 4 to 7 cm wide, the apex obtuse, rounded, or rarely subacute, the base distinctly auricled, the lower surface paler than the upper, the midrib impressed on the upper surface, very prominent beneath, the lateral nerves very numerous, more distinct on the upper surface than on the lower; petioles none, or very stout and less than 3 mm long. Inflorescence axillary, solitary or in pairs, rarely more than 3-flowered, the flowers umbellately disposed at the apex of the peduncle which is 1 to 1.5 cm long or less, the pedicels slender, 1 to 2 cm long, elongated in fruit. Buds globose. Sepals 4. Petals none. Stamens indefinite. Fruit ovoid or ellipsoid, about 2 cm long, rugose when dry, the pedicels in fruit frequently 4 cm in length.

MINDANAO, District of Zamboanga, Sax River, *Williams 2339* (type), February 20, 1905, *Copeland 1617*, February, 1905: Lake Lanao, Camp Keithley, *Mrs. Clemens 1019*, May, 1907. BASILAN, *For. Bur. 6126 Hutchinson*, July, 1906.

A species much resembling *Calophyllum venulosum* Zoll. of Java, differing especially in its shorter petioles, the auriculate bases of the leaves, and the terminal buds only puberulent, not sericeous.

CRATOXYLON Blume.

1. Petals inappendiculate § ANCISTROLOBUS.
   2. Flowers in axillary, short, few-flowered cymes ..... 1. *C. chinense*
   2. Flowers in terminal, often leafy panicles.
      3. Leaves distinctly petioled, lanceolate or rarely oblong-lanceolate, gradually narrowed at both ends; panicles ample ..... 2. *C. celebicum*
      3. Leaves shortly petioled or subsessile; oval to elliptic, or oblong-ovate, base usually broad, rounded, often subcordate; panicles usually small. 3. *C. blancoi*
1. Petals with a basal squamule; flowers in few-flowered, axillary cymes. § TRIDESMIS ..... 4. *C. formosum*

1. **Cratoxylon chinense** (Retz.) comb. nov.

Hypericum chinense Retz. Obs. 5 (1789) 27.

Hypericum cochinchinense Lour. Fl. Cochinch. (1790) 472.

Hypericum biflorum Lam. Encycl. 4 (1797) 170.

Ancistrolobus ligistrinus Spach Suit. Buff. 5 (1836) 358.

Cratoxylon polyanthum Korth. Verhandl. Nat. Geschied. Bot. (1839–42) 175, *t. 36;* Dyer in Hook. f. Fl. Brit. Ind. 1 (1874) 257; Miq. Fl. Ind. Bat. 1^2 (1859) 516; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 23 (1886) 74.

Cratoxylon ligustrinum Blume Mus. Bot. Lugd.-Bat. 2 (1852) 16.

Cratoxylon biflorum Turcz. in Bull. Soc. Nat. Mosc. 36^1 (1863) 580.

CULION, *Merrill 454*.

Southern China to Burma, the Malay Peninsula and Archipelago.

This species is rather variable, and is apparently rare in the Philippines, although it has previously been reported from the Archipelago by both Vidal and F.-Villar. What is apparently the earliest valid name is here adopted, as Britten [10] shows that the part of the volume of Lamack's work containing the description of *Hypericum biflorum* really appeared in the year 1797, and not in 1789, the date given on the title page.

2. **Cratoxylon celebicum** Blume Mus. Bot. Lugd.-Bat. 2 (1852) 16; Merr. in For. Bur. (Philip.) Bull. 1 (1903) 39.

Ancistrolobus floribundus Turcz. in Bull. Soc. Nat. Mosc. 31[1] (1858) 382.

Cratoxylon floribundum F.-Vill. Nov. App. (1880) 16; Vid. Phan. Cuming. Philip. (1885) 95, Rev. Pl. Vasc. Filip. (1886) 92; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 96.

Cratoxylon polyanthum F.-Vill. Nov. App. (1880) 15, non Korth.

Cratoxylon sumatranum Naves in Blanco Fl. Filip. ed. 3, *pl. 308*, non Blume.

LUZON, Province of Cagayan, *For. Bur. 5246, 11316, 11312, 12270 Klemme:* Province of Ilocos Norte, *Cuming 1221*, type number of *Ancistrolobus floribundus* Turcz.: Province of Benguet, *Elmer 6061:* Province of Pangasinan, *Cuming 965, Merrill s. n.:* Province of Nueva Ecija, *For. Bur. 8434 Curran:* Province of Zambales, *Merrill 2111, 2928, Bur. Sci. 2593 Foxworthy, For. Bur. 6922 Curran, For. Bur. 857 Maule:* Province of Laguna, *Hallier, Elmer:* Province of Rizal, *For. Bur. 1157 Ahern's collector, Merrill 1689, 2823:* Province of Bataan, *For. Bur. 6292 Curran, For. Bur. 1601, 2713, 3035 Borden, Whitford 27, Merrill 3152, Williams 102:* Province of Bulacan, *For. Bur. 7183 Curran, Yoder 209, For. Bur. 11173 Aguilar:* Manila, *Ahern 728:* Province of Tayabas, *For. Bur. 6039 Kobbe, Merrill 2609, For. Bur. 10744 Curran:* Province of Albay, *For. Bur. 10568 Curran.* MINDORO, *For. Bur. 4071, 11390 Merritt.* MINDANAO, District of Davao, *Williams 2790, DeVore & Hoover 165, 169, Copeland 883:* Province of Surigao, *Ahern 358:* Agusan Valley, *For. Bur. 7594 Hutchinson.*

A species widely distributed in the Philippines, and somewhat variable, in some forms approaching *Cratoxylon blancoi* Blume, but usually readily distinguished from that species by its much narrower, differently shaped leaves, and larger panicles. It is well represented by Naves' plate, cited above. *Cratoxylon floribundum* (Turcz.) F.-Vill., appears to be in all respects identical with *C. celebicum* Blume, and is accordingly here reduced. The wood is considerably utilized in the manufacture of charcoal, the common name for charcoal, *uling,* appearing in most of the native names. Common names: T., *Guyong-guyong;* Cag., *Uttu;* Zamb., *Panagulingon;* V. (Surigao), *Ulingon;* Manobo (Agusan Valley), *Ulingun.*

Celebes.

3. **Cratoxylon blancoi** Blume Mus. Bat. Ludg.-Bat. 2 (1852) 17; Vid. Phan. Cuming. Philip. (1885) 95, Rev. Pl. Vasc. Filip. (1886) 51; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 96.

Hypericum olympicum Blanco Fl. Filip. (1837) 613; ed. 2 (1845) 429; ed. 3, 2:416, non Linn.

Ancistrolobus micradenius Turcz. in Bull. Soc. Nat. Mosc. 31[1] (1858) 382.

Cratoxylon micradenium F.-Vill. Nov. App. (1880) 16.

Cratoxylon arborescens Vid. Cat. Pl. Prov. Manila (1880) 17, Sinopsis Atlas (1883) *t. 10, f. A.;* F.-Vill. Nov. App. (1880) 16, non Blume.

Cratoxylon sumatranum F.-Vill. Nov. App. (1880) 16, non Blume.

Cratoxylon hornschuchii Naves in Blanco Fl. Filip. ed. 3, *pl. 254*, non Korth.

[10] Journ. Bot. 44 (1906) 319.

LUZON, Province of Ilocos Sur, *For. Bur. 7107 Klemme:* Province of Benguet, *Elmer 6455:* Province of Pangasinan, *Merrill 2866,* small form: Province of Bulacan, *For. Bur. 7165 Curran:* Province of Rizal, *For. Bur. 5192 Curran:* Province of Bataan, *For. Bur. 1478 Ahern's collector:* Province of Tayabas, *Cuming 700:* Province of Camarines, *Ahern 31, 828, For. Bur. 10422:* Province of Albay, *For. Bur. 10582 Curran.* BOHOL, *Cuming 1822,* type number of *Ancistrolobus micradenius* Turcz. MASBATE, *For. Bur. 991 Clark.* NEGROS, *For. Bur. 12339 Everett.* MINDANAO, District of Zamboanga, *Ahern 655;* Lake Lanao, *Mrs. Clemens 464.* BASILAN, Hallier s. n.

Like the preceding species widely distributed in the Philippines, and even more variable than that, approaching it in some forms. The extreme form can, however, be readily distinguished by its broader, differently shaped leaves, which are broad, rounded, and biauriculate at the base, and very short petioled. It is unquestionably the form described by Blanco as *Hypericum olympicum,* on which Blume based his *Cratoxylon blancoi,* although it is probable that Blanco included both this, and the more common *C. celebicum* in his species. *Cratoxylon blancoi* Blume is undoubtedly very closely allied to *C. hornschuchii* Blume. Common names: T., *Guyong-guyong, Cansilay;* Il., Pang., *Baringcocoron;* B., *Saling-gogon;* V., *Oringon, Pagalingan.*

Endemic.

Var. **apiculatum** var. nov.

Differt a typo foliis minoribus, 4 ad 6 cm longis, anguste obovatis, basi angustatis, apice latis, abrupte breviter apiculato-acuminatis.

GUIMARAS, Buena Vista, *For. Bur. 31 Gammill,* August, 1903, V., *Cansilay.*

4. **Cratoxylon formosum** (Jack) Dyer in Hook. f. Fl. Brit. Ind. 1 (1874) 258; Vidal Phan. Cuming. Philip. (1885) 95, Rev. Pl. Vasc. Filip. (1886) 52, Sinopsis Atlas (1883) *t. 10, f. B;* F.-Vill. Nov. App. (1880) 16.

Elodea formosa Jack in Hook. Journ. Bot. 1 (1834) 374.

Tridesmis ochnoides Spach Suit. Buff. 5 (1836) 358.

Hypericum aegyptium Blanco Fl. Filip. (1837) 615; ed. 2 (1845) 430; ed. 3, 2:418, non Linn.

LUZON, Province of Zambales, *For. Bur. 6959 Curran, Merrill 2115, 2950:* Province of Bulacan, *For. Bur. 11169 Aguilar:* Province of Laguna, *Bur. Sci. 2385 Foxworthy:* Province of Rizal, *For. Bur. 481, 2879 Ahern's collector, Merrill 1710, 2638:* Province of Tayabas, *Elmer 9109, For. Bur. 10276 Curran, Merrill 3997.* CULION, *Merrill 584.* GUIMARAS, *For. Bur. 283 Gammill.* LEYTE, *Cuming 1754.* MINDANAO, District of Zamboanga, *For. Bur. 9339 Whitford & Hutchinson.*

Common names: T., *Aligogon, Banga, Apang;* Zamb., *Cayantol;* V., *Camontayo.*

Siam to the Malay Peninsula and Archipelago.

HYPERICUM Linn.

Hypericum loheri sp. nov.

Abuscula glabra circiter 1 m alta; foliis oblongis vel elliptico-oblongis, chartaceis vel subcoriaceis, circiter 3 cm longis, glanduloso-punctatis, subtus subglaucis, subsessilibus, apice acutis vel brevissime acuminatis, nervis tenuibus, utrinque 5 ad 7; floribus axillaribus solitariis, longe pedicellatis, circiter 2 cm diametro; stylis coalitis; ovario 5-loculare.

A glabrous shrub about 2 m high. Branches slender terete, reddish-

brown rarely somewhat grayish. Leaves opposite, oblong or elliptic-oblong, 2.5 to 3 cm long, 7 to 12 mm wide, firmly chartaceous or subcoriaceous, shining, narrowed and acute at both ends or the apex very shortly apiculate-acuminate, glandular-punctate, beneath slightly glaucous; nerves 5 to 7 on each side of the midrib, slender, obscure, the reticulations obsolete; petioles very short or none. Flowers white, axillary, solitary, about 2 cm in diameter, their pedicels about 1 cm long, with three or four pairs of short imbricate bracteoles at the base. Sepals ovate, acute or obscurely acuminate, 1.5 mm long. Petals oblong-obovate, inequilateral, 10 to 12 mm long, 6 to 7 mm wide, apex more or less obliquely subtruncate or rounded. Stamens 5-adelphous; filaments 5 to 9 mm long. Ovary and style 11 mm long, the former narrowly oblong-ovoid, 5-celled, the latter consisting of five entirely united styles. Capsules about 10 mm long, 3 mm in diameter, crowned by the style, septicidally 5-valved; seeds 1 mm long, thick-spindle-shaped.

LUZON, Province of Benguet, Ambuklao, *Loher 66* in Herb. Kew.; Mount Ugo, *Bur. Sci. 5716 Ramos*, December, 1908: Province of Zambales, Mount Pinatubo, *Bur. Sci. 2562 Foxworthy*, April, 1907.

A species apparently most closely allied to *Hypericum formosanum* Maxim., and *H. giraldii* Keller.

FLACOURTIACEÆ.

AHERNIA gen. nov.

Flores hermaphroditi. Sepala 4 vel 5, imbricata, in petala transeuntes. Petala 10 ad 15, sepalis consimilia sed interiora gradatim angustiora. Stamina indefinita, epipetala vel perigyna, filamentis filiformibus, elongatis; antherae parvae, abbreviatae, loculis longitudinaliter dehiscentibus. Ovarium ovoideum vel ellipsoideum, 1-loculare, placentae 5, ∞-ovulatae; stylus simplex; stigmate minuto, obscure 3-lobato vel subdisciforme. Fructus ovoideus vel ellipsoideus, ∞-spermus, pericarpio crustaceo, obscure longitudinaliter sulcato, indehiscente. Semina obovoidea, plus minus compressa. Arbor subglabra. Folia alterna, chartacea vel submembranacea, acuminata, integra vel supra obscure repando-crenata, basi 5-nervia vel 5-plinervia, 2-glandulosa. Flores mediocres in racemis simplicibus axillaribus dispositi.

Ahernia glandulosa sp. nov.

Arbor subglabra 8 ad 15 m alta; foliis alternis, ovatis vel oblongo-ovatis, usque ad 15 cm longis, chartaceis vel submembranaceis, acuminatis, basi obtusis, rotundatis vel subtruncatis, 2-glandulosis, 5-nerviis vel 5-plinerviis; floribus circiter 1 cm longis, in racemis axillaribus solitariis dispositis, hermaphroditis.

A tree 8 to 15 m high, glabrous except the infloresence and fruits. Branches terete, brownish-gray, glabrous, obscurely lenticellate. Leaves alternate, estipulate, ovate or oblong-ovate, chartaceous or submembranaceous, 9 to 15 cm long, 4 to 8 cm wide, glabrous, shining and nearly

the same color on both surfaces, entire or obscurely repand above, the apex rather abruptly acuminate, the base usually broad, rounded or subtruncate, and with two glands either on the margins at the juncture with the petiole, or on the petiole itself; basal nerves 5, the outer shorter pair from the very base of the leaf, the inner and longer more prominent pair leaving the midrib a short distance above the base and extending to beyond the middle, the lateral nerves above the basal ones two or three on each side of the midrib, ascending, prominent, anastomosing, the reticulations distinct, rather lax; petioles 2.5 to 4.5 cm long. Racemes in the upper axils, solitary, in flower 2.5 to 3.5 cm long, few-flowered, in fruit somewhat longer, densely gray-pubescent, the pedicels 5 to 8 mm long, longer in fruit. Petals and sepals scarcely distinct, and irregularly arranged, the sepals 4 or 5, ovate, acute or slightly acuminate, 10 mm long, 6 mm wide, densely pubescent outside, strongly imbricate, the outer two or three entirely free, the inner two or three more or less united with the petals and usually staminiferous; petals 10 to 15, similar to the sepals, and like them densely gray-pubescent, of equal length but narrower, gradually narrower inwards, the innermost ones linear and only 1 to 1.5 mm wide, all more or less imbricate and all connate below. Stamens indefinite, inserted on the base of the petals and on the inner sepals; filaments very slender, elongated, very slightly united at the base, 6 to 10 mm long; anthers minute, longitudinally dehiscing, less than 0.5 mm long. Ovary free, densely gray-pubescent, slightly stipitate, ovoid or ellipsoid, narrowed at both ends, 1-celled, with 5 parietal placentae, each bearing numerous ovules; style simple, terminal, glabrous or slightly pubescent at the base, 2 to 4 mm long; stigma minute, subdisciform or obscurely 3-lobed, not larger than the style. Fruit crustaceous, indehiscent, ovoid or ellipsoid, 1.5 to 2 cm long, apiculate, densely gray-pubescent, obscurely longitudinally ribbed; seeds many, obovoid, often irregularly compressed, black, shining, the testa crustaceous, the albumen fleshy. Rarely flowers are found with an imperfect ovary which is nearly glabrous, and contains no ovules.

LUZON, Province of Tayabas, Mount Banajao, *For. Bur. 8039 Curran & Merritt*, November, 1907, in forests at an altitude of about 600 m, in flower: Province of Rizal, Bosoboso, *For. Bur. 2005 Ahern's collector*, November, 1904, with nearly mature fruits: Province of Bataan, Lamao River, *Williams 531*, January, 1903, with mature fruits, in forests at an altitude of about 110 m.

This new genus is somewhat anomalous, but seems to be most closely allied to *Oncoba* Forsk., differing in its hermaphrodite flowers, its inner perianth lobes smaller than the outer ones, the stamens slightly united and inserted on the petals and sepals, its racemose inflorescence, etc. In its perianth characters it seems also to approach *Pyramidocarpus* Oliver, of Africa, but is quite different from that genus in other floral characters.

The above new genus is dedicated to Major George P. Ahern, Director of Forestry for the Philippine Islands, in commemoration of his active interest in, and strong support of botanical investigations in the Archipelago during the past nine years.

HOMALIUM Jacq.

Homalium curranii sp. nov. § *Myriantheia.*

Arbor circiter 16 m alta, glabra, inflorescentiis exceptis; foliis oblongo-ellipticis, coriaceis, nitidis, usque ad 20 cm longis, acutis, margine leviter crenatis, nervis utrinque 8; inflorescentiis axillaribus terminalibusque, paniculatis, folia aequantibus, dense pubescentibus; floribus 4- vel 5-meris; sepalis anguste oblongis, 5 mm longis, pubescentibus; petalis sepalis aequilongis, oblongo-spatulatis; staminibus brevibus, 12 vel 15.

A tree about 16 m high, glabrous except the inflorescence. Branches brown, terete, lenticellate. Leaves oblong-elliptic, 18 to 20 cm long, 7 to 9 cm wide, coriaceous, shining, acute at both ends, margins slightly crenate; nerves 8 on each side of the midrib; rather distinct beneath, the reticulations rather close; petioles stout, rugose, 1 cm long, Panicles terminal and axillary, as long as the leaves, densely pale-pubescent, the branches scattered, spreading, few, the lowest ones often 10 to 12 cm long, bracts ovate to ovate-lanceolate, pubescent 4 to 5 mm long, the bracteoles similar but much smaller. Flowers greenish-white, very shortly pedicelled, racemosely disposed, the buds densely pale-pubescent. Sepals four or five, narrowly oblong, obtuse, densely pubescent, 5 mm long, 1.5 mm wide. Petals as long as the sepals, less pubescent, oblongo-spatulate, obtuse, 1.8 mm wide, base narrowed. Stamens in groups of threes opposite each petal; filaments glabrous, about 1 mm long. Ovary villous; styles usually four, glabrous, short.

LUZON, Province of Benguet, near Twin Peaks, *For. Bur. 10811 Curran*, December, 1908, on river banks.

A species allied to *Homalium luzoniense* F.-Vill., and to *H. villarianum* Vid., but quite distinct from both in its floral characters.

HYDNOCARPUS Gaertn.

Hydnocarpus subfalcata sp. nov.

Arbor subglabra 5 ad 15 m alta, dioica; foliis subcoriaceis vel coriaceis, oblongo-ovatis vel oblongo-lanceolatis rectis vel leviter subfalcatis, glabris, nitidis, valde caudato-acuminatis, basi acutis vel rariter obtusis, integris, nervis utrinque 5, obliquis, prominentibus; floribus axillaribus, femineis solitariis, pedicellatis, masculinis paniculato-racemosis, sepalis petalis staminibusque 5; fructibus pyriformibus, usque ad 6 cm longis, dense ferrugineo-pubescentibus, basi valde angustatis.

A subglabrous dioecious tree 5 to 15 m high. Branches terete, slender, gray, the younger branchlets often brown, the growing tips more or less ferruginous-pubescent. Leaves alternate, oblong-ovate to oblong-lanceolate or lanceolate, 8 to 15 cm long, 3 to 6 cm wide, coriaceous or subcoriaceous, straight or slightly subfalcate, shining, usually brownish when dry and paler beneath, the margins entire, the apex strongly caudate-acuminate usually falcate, the acumen blunt, the base acute, rarely

obtuse; nerves 5 on each side of the midrib, prominent, sharply ascending, slightly curved, obscurely anastomosing, usually brown when dry in contrast to the pale lower surface of the leaf, the reticulations fine, distinct; petioles 5 to 10 mm long, often slightly pubescent. Flowers small, 5-merous, the pistillate ones solitary, axillary, on 3 to 4 mm long pedicels; sepals free, imbricate, ovate, 2 to 4.5 mm long, the inner two much larger than the outer ones, pubescent; petals suborbicular, 3 mm in diameter, membranaceous, rounded, ciliate; ovary ovoid, 2 mm in diameter, densely pubescent, 1-celled with three parietal placentae, the ovules numerous; stigmas 3, spreading, flattened, 2 mm long. Staminate flowers small, in very short paniculate racemes, the inflorescence slightly pubescent, axillary, solitary, about as long as the petioles; sepals 5, free, ovate, acute or acuminate, the two inner ones larger than the outer, about 3 mm long in bud, outside ferruginous-pubescent; petals 5, ovate or rounded, membranaceous, ciliate, each with a large orbicular, ciliate scale at the base, about 1 mm in diameter; rudimentary ovary none; stamens 5; filaments stout, tapering upwards, 1 mm long, glabrous; anthers 1 mm long, about 0.6 mm long, the connective rather broad. Fruit pyriform, indehiscent, the pericarp crustaceous, rather brittle when dry, densely brown- or ferruginous-pubescent, when mature about 6 cm long, the base much narrowed; seeds about 8 in each fruit, ellipsoid to narrowly ovoid, often irregularly compressed, 1.5 to 2 cm long.

LUZON, Province of Zambales, *For. Bur. 5906* (type), *5994 Curran*, January, 1907, with staminate flowers and fruit, *For. Bur. 379, 917 Maule*, March, June, 1904, the former with pistillate flowers, the latter with fruit; *Merrill 2934*, *Hallier s. n.:* Province of Tayabas (Principe), Baler, *Merrill 1006*. Common names given in Zambales are *Mala usa, Dalinias, Binting dalaga*, and *Putian;* in Baler *Ngeret*.

This species is closely allied to *H. venenata* Gaertn. of Ceylon, but differs in its less numerously nerved and entire leaves, and in its fruit being strongly narrowed at the base, and pyriform in shape.

Although the Ceylon flora is not especially closely allied to that of the Philippines, and although the *Flacourtiaceae* is not strongly represented in either region, this family contains a striking series of species peculiar to the two, including the above which is manifestly closely allied to *Hydnocarpus venenata* Gaertn., a species confined to Ceylon; the genus *Osmelia* with but four known species, two closely allied ones confined to the Philippines, one in Celebes, and one in Ceylon; and the genus *Trichadenia*, previously a monotypic one and confined to Ceylon, but of which a second species has now been found in Luzon.

TRICHADENIA Thwaites.

Trichadenia philippinensis sp. nov.

Arbor dioica, subglabra, 15 ad 20 m alta; foliis longe petiolatis, coriaceis vel subcoriaceis, elliptico-oblongis vel oblongis, nitidis, glabris, 14 ad 30 cm longis, integris vel supra obscure repandis, acuminatis, basi rotundatis; nervis utrinque 10 ad 12, prominentibus; racemis axillaribus, solitariis, usque ad 10 cm longis, ferrugineo-puberulis, calycibus irregulariter 2- vel 3-lobatis.

A dioecious subglabrous tree 15 to 20 m high. Branches stout, brown or grayish, glabrous, terete, with very large leaf-scars, the ultimate branchlets densely ferruginous-pubescent; stipules linear-lanceolate, pubescent, decidous, about 6 mm long. Leaves alternate, coriaceous or subcoriaceous, shining, elliptic-oblong or oblong, 14 to 30 cm long, 6 to 15 cm wide, glabrous, entire, or the margins in the upper portion slightly and obscurely repand, the apex rather abruptly and sharply acuminate, the base broad, rounded; nerves 10 to 12 on each side of the midrib, prominent, anastomosing, the reticulations distinct, rather lax; petioles 3 to 8 cm long, when young ferruginous-puberulent, ultimately glabrous. Flowers in axillary, solitary, ferruginous-puberulent racemes which are 10 cm long or less: pistillate flowers pedicillate, the calyx glabrous, splitting from the top into two or three irregular lobes; petals 5, free, ovate to elliptic-ovate, obtuse, about 4 mm long, 2.5 to 3 mm wide, glabrous except the oblong-lanceolate, densely pubescent scale on the inside, which is nearly 3 mm long; ovary ovoid, pubescent, 1-celled, with three parietal placentae, each with one ovule; styles three, short; stigmas three, thick, large, subpeltate, irregularly lobed: staminate flowers similar to the pistillate, the irregular calyx divisions reflexed in anthesis; stamens 5; filaments 2.5 mm long; anthers 2 mm long, 2-locellate. Fruit (immature) subglobose, glabrous, 2 cm in diameter, 1-seeded, the pericarp crustaceous when dry.

LUZON, Province of Rizal, Tanay, *Merrill 2280* pistillate flowers; Bosoboso, *For. Bur. 2982 Ahern's collector*, staminate flowers, *Bur. Sci. 2649 Ramos*, staminate flowers: Province of Laguna, Santa Maria Mavitac, *For. Bur. 10065 Curran*, February, 1908, sterile: Province of Tayabas, Lagumanoc, *For. Bur. 9 Ware*, immature fruit. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 695*, with detached fruit.

A species closely allied to *Trichadenia zeylanica* Thwaites, the type of the genus, but is readily distinguished by its more numerously nerved, entire or nearly entire, glabrous leaves, as well as by its smaller flowers, the calyx splitting irregularly from the top. A most interesting discovery, the genus previously consisting of the single species *T. zeylanica* Thwaites, confined to Ceylon. Local Tagalog names are given by Ramos as *Tadong* or *Tandong*, and by Ware as *Malapingan*.

LECYTHIDACEÆ.

BARRINGTONIA Forst.

Barringtonia balabacensis sp. nov. § *Stravidium*.

Arbor circiter 10 m alta, glabra; foliis chartaceis, oblongis, nitidis, 25 ad 40 cm longis, basi acuminatis, apice breviter abrupteque acuminatis, margine minute crenato-serratis, nervis utrinque 16 ad 18, prominentibus; spicis axillaribus, usque ad 40 cm longis; fructibus anguste oblongis, circiter 10 cm longis, 2.5 cm diametro, plus minus quadrangulatis.

A tree about 10 m high, glabrous throughout. Leaves oblong, chartaceous, shining, 25 to 40 cm long, 8 to 12 cm wide, the base somewhat

acuminate, the apex sharply and abruptly acuminate, the acumen about 1 cm long, the margins rather finely crenate-serrate or in the lower part subentire; petioles 3 to 6 cm long; nerves 16 to 18 on each side of the midrib, prominent beneath, anastomosing, the reticulations distinct. Spikes axillary, many-flowered, in anthesis 10 to 15 cm long, in fruit up to 40 cm in length and somewhat thickened. Flower-buds sessile, each subtended by three bracteoles, a lanceolate, acuminate middle one about 5 mm long, and two lateral, much smaller ones. Calyx-tube 5 mm long, somewhat quadrangular, the lobes three, one of which is sometimes split at the apex, ovate, obtuse, about 6 mm long. Petals 4, elliptic, 1.3 cm long. Mature flowers not seen. Fruit narrowly oblong, about 10 cm long, 2.5 cm thick, somewhat quadrangular, the angles rounded, the style persistent in young fruits, slender, 5 cm long.

BALABAC, Bur. Sci. *422 Mangubat*, March, 1906.

A species said by the collector to be rare, growing in forests, and used by the natives to poison fish. N. v. (Moro), *Ulam*.

COMBRETACEÆ.

COMBRETUM Linn.

Combretum extensum Roxb. Hort. Beng. (1814) 28; Fl. Ind. **2** (1824) 229; King in Journ. As. Soc. beng. **66**[2] (1897) 337.

PALAWAN, Mount Pulgar, *Bur. Sci. 547 Foxworthy*, March, 1906. MINDORO, Madrugo River, *For. Bur. 4074 Merritt*, April, 1906.

British India to the Malay Peninsula, Andaman Islands, and Java; new to the Philippines.

TERMINALIA Linn.

Terminalia comintana (Blanco) comb. nov.

Bucida comintana Blanco Fl. Filip. (1837) 856, ed. 2 (1845) 265, ed. 3, **2**:48.

Terminalia chebula F.-Vill. Nov. App. (1880) 80, non Retz.

Terminalia multiflora Merr. in Govt. Lab. Publ. (Philip.) **17** (1904) 34.

Terminalia polyantha Presl Epim. Bot. (1851) 213?

LUZON, Province of Zambales, Canad, *For. Bur. 5897 Curran:* Province of Pangasinan, Cape Bolinao, *For. Bur. 8381 Curran & Merritt:* Province of Rizal, Bosoboso, *Merrill 2796* (type of *Terminalia multiflora* Merr.), *2647, For. Bur. 2984, 2009 Ahern's collector, For. Bur. 10035 Curran, Bur. Sci. 3265 Ramos:* Province of Batangas, San Jose, *Guerrero s. n.* (topotype of *Bucida comintana* Blanco): Province of Bataan, Mount Mariveles, *Elmer 6990, Whitford 1257:* Province of Tayabas (Infanta), Tinuan River, *Whitford 767:* Province of Camarines, Mount Isarog, *For. Bur. 10448 Curran.* MINDORO, *For. Bur. 6193, 8708 Merritt, For. Bur. 12211 Rosenbluth.* TICAO, *For. Bur. 1030 Clark.* MINDANAO, District of Zamboanga, *For. Bur. 9063 Whitford & Hutchinson.* Local names; Zambales *Bingas, Batitinan;* Pangasinan *Magtalopoi;* Rizal *Naghubo, Palauag, Saplungan;* Batangas *Dinglas;* Tayabas (Infanta) *Bangias;* Camarines *Tiroon;* Mindoro *Bangias;* Ticao *Batitinan-babaye;* Zamboanga *Malatagum, Batitinan.*

Blanco's *Bucida comintana* has previously been considered as a doubtful species, and I have expressed the opinion [11] that it was referable to the genus *Calycopteris*, and that F.-Villar was wrong in transferring it to the genus *Terminalia*. While

[11] Govt. Pab. Publ. (Philip.) **17** (1904) 34.

F.-Villar was certainly in error in transferring Blanco's species to *Terminalia chebula* Retz., I am now of the opinion that he was correct as to the genus, and that *Bucida comintana* Blanco is identical with the species previously described by me as *Terminalia multiflora*. Through the kindness of Dr. Leon Guerrero, member of the Philippine Assembly, we have been able to secure specimens of the tree locally known as *Dinglas* in the town of San Jose, Province of Batangas, which native name was cited by Blanco in his original description and from which town Blanco secured his specimens. A similar name occurs on specimens from Zambales, *Bingas*, while *Bingias* is applied to the same species in the Province of Tayabas, and in Mindoro. Blanco did not have mature fruits when he described the species, and apparently assumed that the calyx was persistent in ripe fruits; the calyx-rim is, however, very early deciduous. The specific name is from an old name of the Province of Batangas, according to Blanco.

Terminalia polyantha Presl is probably not specifically distinct from the above species, but there are slight differences in the leaves. I previously reduced Presl's species to *Terminalia catappa* Linn., from the abridged description given by Miquel, to which species it is not at all allied; a specimen of *Cuming 1516*, on which the species was based, is now in our herbarium.

A specimen from Celebes in the Kew Herbarium, collected by Beccari, is probably referable to *Terminalia comintana* (Blanco) Merr., which species is otherwise not known from outside of the Philippines.

Terminalia quadrialata sp. nov.

Arbor glabra, 15 ad 35 m alta; foliis oblongo-obovatis vel elliptico-obovatis, subcoriaceis, nitidis, usque ad 20 cm longis, apice breviter acuminatis, basi sensim angustatis, decurrento-alatis, nervis utrinque 15 ad 20, distinctis, reticulis obscuris; paniculis terminalibus, ramis patulis; fructibus 2 ad 3 cm longis, apice retusis, regulariter 4-alatis, alis tenuiter coriaceis vel submembranaceis, 1 ad 1.3 cm latis.

A tree, glabrous throughout, 15 to 35 m high. Branches rather stout, grayish or reddish-brown, lenticellate. Leaves somewhat crowded towards the apices of the branches, oblong-obovate to elliptic-obovate, 15 to 25 cm long, 4 to 10 cm wide, subcoriaceous, shining, glabrous, of about the same color on both surfaces when dry, the apex shortly acuminate, rarely subobtuse, gradually narrowed towards the base which is somewhat decurrent; nerves 15 to 20 on each side of the midrib, distinct, parallel, anastomosing, the reticulations lax, obscure; petioles stout, usually 5 mm long or less, but the lamina sometimes decurrent to the branch, so that the leaves often appear to be sessile or subsessile. Flowers unknown. Fruiting panicles terminal, 20 cm long or less, the branches spreading, sometimes reflexed, the lower ones sometimes 8 cm long, with few secondary branches, or unbranched, the upper ones gradually shorter, scattered, more or less thickened towards their apices, and in the apical portions bearing many pedicel-scars. Fruit, including the wings, ellipsoid or suborbicular in outline, 2 to 3 cm long, nearly as wide, retuse at the apex, rounded at the base, the seed-bearing portion very narrow, thin-walled, usually but 5 mm thick; wings four, equal, thinly coriaceous or submembranaceous, 1 to 1.3 cm wide, transversely nerved; seeds oblong, 6 to 7 mm long.

LUZON, Province of Sorsogon, Sua, *For. Bur. 4526 Zschokke.* MASBATE, *For. Bur. 12562, 12558* (type), *12583, 12597, 12814 Rosenbluth.* SAMAR, *For. Bur. 12617, 12874 Rosenbluth.* In forests up to 100 m altitude.

A species well characterized by its four-winged fruits, the wings all the same width, very thin, and the seed-bearing portion very narrow. All the specimens cited bear the native name *Toog.*

MELASTOMATACEÆ.

MEDINILLA Gaudich.

Medinilla curranii sp. nov.

Frutex scandens, glabra; ramis ramulisque teretibus; foliis verticillatis, quaternis, elliptico-ovatis, acutis vel breviter acuminatis, circiter 14 cm longis, chartaceis vel subcoriaceis, 5-plinerviis, petiolatis; cymis axillaribus, brevibus, paucifloris; floribus 4-meris, circiter 3 cm longis.

A scandent shrub, glabrous throughout. Branches and branchlets terete, gray. Leaves verticillate, quaternate, elliptic-ovate, about 14 cm long, 6 to 7 cm wide, chartaceous, or subcoriaceous, shining, the base acute, the apex acute or very shortly acuminate; nerves 5, the middle one prominent, the lowest pair leaving the midrib near the base, the upper pair at 2 or 3 cm above the base, reticulations obsolete; petioles about 1.5 cm long. Cymes from the branches, in the axils of fallen leaves, usually solitary, few-flowered, the peduncles about 1 cm long. Flowers white and pink, nearly 3 cm long. Calyx cup-shaped, about 11 cm long, truncate. Petals 4, about 20 mm long, 9 mm wide above, narrowly obovate, narrowed below. Stamens 8, unequal; filaments about 7 mm long; four anthers about 18 mm long, and four 10 to 12 mm long, the anterior lobes two, about 1.5 mm long, the posterior one club-shaped, 2 to 3 mm long, the short anthers relatively stouter than the long ones. Style 11 mm long.

LUZON, Province of Camarines, Caramoan, *For. Bur. 12289 Curran,* June 27, 1908.

A species allied to *Medinilla verticillata* Merr., differing in its much larger and 4-merous flowers.

Medinilla mindorensis sp. nov.

Frutex scandens, glabra; ramis ramulisque tenuibus, teretibus; foliis oppositis, petiolatis, ovatis, ellipticis, vel obovatis, acuminatis, subcoriaceis, 7 ad 11 cm longis, 3- vel 5-plinerviis, reticulis obsoletis; paniculis terminalibus, 15 ad 20 cm longis, diffusis, pedunculatis; floribus 4-meris; bracteis membranaceis, reticulatis, obovatis, 8 ad 10 mm longis, persistentibus.

A scandent shrub glabrous throughout. Branches and branchlets slender, terete, light-gray. Leaves opposite, ovate to elliptic, rarely obovate, 7 to 11 cm long, 3.5 to 6 cm wide, subcoriaceous, shining, the base acute or acuminate, the apex rather strongly acuminate; nerves three, sometimes five, the additional pair, if present, faint, the lateral ones

leaving the midrib slightly above the base of the leaf, reaching the apex, or evanescent, the reticulations obsolete; petioles 0.5 to 2 cm long. Panicles terminal, 15 to 20 cm long, rather diffuse, the peduncles 7 to 10 cm long, the lower branches 5 to 6 cm long, spreading, opposite, few-flowered. Pedicels slender, 3 to 10 mm long, the bracts persistent, obovate, about 1 cm long. Flowers 4-merous. Calyx urceolate, 3 mm long, truncate. Petals 4, broadly obovate, 4 mm long. Stamens 8, their anthers about 4 mm long, the filaments of four about 4 mm long, and of the other four 3 mm long, the spur and appendages small. Bracteoles persistent, obovate, reticulate, 8 to 10 mm long, white or pink, two for each flower.

MINDORO, Ibalo River, *For. Bur. 11489 Merritt*, May, 1908; Mount Halcon, *For. Bur. 4368 Merritt*, June, 1906.

Well characterized by its diffuse panicles, rather small flowers and prominent, persistent, reticulate bracts and bracteoles.

Medinilla ovalis sp. nov.

Frutex erecta vel scandens, subglabra; ramis ramulisque teretibus, minute stellato-lepidotis; foliis oppositis, petiolatis, ovalibus, 5 ad 8 cm longis, subcoriaceis, apice breviter abrupteque acuminatis, basi obscure 5- vel 7-plinerviis; inflorescentiis terminalibus, paniculatis, pedunculatis, 10 ad 12 cm longis, minute stellato-lepidotis; floribus 4-meris, circiter 1 cm longis.

An erect or scandent shrub, the younger branchlets, petioles, midrib of the leaves on the lower surface, and panicles minutely brown-stellate-lepidote, the indumentum scarcely visible without a lens. Branches grayish-brown, terete, nearly glabrous, the branchlets sometimes slightly angled; nodes smooth. Leaves opposite, oval, subcoriaceous, 5 to 8 cm long, 3.5 to 6 cm wide, the base broad, rounded or subtruncate, the apex shortly and abruptly acuminate, shining on both surfaces, the lower one paler than the upper, the midrib prominent beneath, minutely lepidote, the surface with scattered, minute, obscure glands; nerves from near the base 5 or 7, obscure, except the midrib, reticulations obsolete; petioles 1 to 2 cm long. Panicles terminal, 10 to 12 cm long, branched above the middle, the branches verticillate, the lower ones about 3 cm long, the bracts oblong, about 6 mm long, the bracteoles minute. Flowers purplish, about 1 cm long, the pedicels 4 mm long or less. Calyx somewhat urceolate, truncate, 4 mm long. Petals 4, 5 mm long. Stamens 8, subequal, the filaments 4 mm long; anthers lanceolate, acuminate, 5 mm long.

LUZON, Province of Albay or Sorsogon, Adlumoy Hills, *For. Bur. 12387 Curran*, June 17, 1908.

A very characteristic species, readily distinguishable by its opposite, oval, obscurely nerved leaves, peduncled terminal panicles, and minute lepidote-stellate indumentum.

MEMECYLON Linn.

Memecylon oligoneuron Blume Mus. Bot. 1 (1851) 353; Miq. Fl. Ind. Bat. 1[1] (1855) 574; Cogn. in DC. Monog. Phan. 7 (1891) 1132; King. in Journ. As. Soc. Beng. 69[2] (1900) 73.

Rhodamnia glabra Vidal Rev. Pl. Vasc. Filip. (1886) 129; Ceron Cat. Pl. Herb. (1892) 79.

Luzon, Province of Tayabas, Guinayangan, *Vidal 782*, in Herb. Kew (type of *Rhodamnia glabra* Vid.): Province of Rizal, *Bur. Sci. 3314 Ramos*, June, 1907: Province of Laguna, *For. Bur. 10111* Curran, February, 1908.

Rhodamnia glabra Vid., was described from fruiting specimens, and in the absence of flowers was placed by Vidal in the *Myrtaceae*. Additional material shows it to be *Memecylon*, and identical with *M. oligoneuron* Blume. The genus *Rhodamnia* must therefore be excluded from the Philippines.

Perak, Penang, Java and Borneo; not previously reported from the Philippines under its correct name.

ERICACEÆ.

VACCINIUM Linn.

Vaccinium alvarezii sp. nov.

Abuscula glabra circiter 3 m alta; foliis oblongo-obovatis vel elliptico-oblongis, coriaceis nitidis, integris, usque ad 10 cm longis, breviter obtuse acuminatis, nervis utrinque 5 vel 6, ascendentibus, tenuibus; racemis axillaribus, solitariis vel binis, foliis bevioribus; corolla cylindracea, leviter inflata, circiter 1 cm longa; staminibus 10, antheris scaberulis, dorso vix aristatis, apice breviter productis appendicibus infundibuliformibus, divaricatis, poris apicaliter dehiscentibus.

A glabrous shrub about 3 m high. Branches reddish-brown, somewhat mottled with gray, terete. Leaves oblong-ovate to elliptic-oblong, 6 to 10 cm long, 2.5 to 5.5 cm wide, entire, the apex shortly and obtusely acuminate, the base acute, margins slightly recurved, shining on both surfaces; nerves 5 or 6 on each side of the midrib, slender, not prominent, ascending, anastomosing, the reticulations lax; petioles 4 to 6 mm long. Racemes axillary, solitary or in pairs, 3 to 5 cm long, the pedicels about 1.5 cm long, articulated with the calyx. Calyx-tube short, the lobes broadly ovate, obtuse, 1.5 to 2 mm long, each lobe gland-tipped. Corolla pink, cylindric, 10 to 11 mm long, about 5 mm. in diameter, slightly inflated in the midle, the lobes erect, ovate, obtuse, 1.5 to 2 mm long. Stamens 10; filaments 4 to 5 mm long, white-villous; anthers 3 mm long, scaberulous, not awned, the apex produced into two short, broad, funnel-shaped divergent tubes, opening by terminal, orbicular pores. Disk prominent crenate-undulate; style 1 cm long.

Luzon, Province of Cagayan, Dalisay River, *For. Bur. 18466 Alvarez*, March, 1909, in forests, altitude about 650 m.

Probably most closely allied to *Vaccinium barandanum* Vid, and *V. benguetense* Vid., but quite distinct from both.

EBENACEÆ.

DIOSPYROS Linn.

Diospyros ahernii sp. nov.

Arbor glabra inflorescentiis fructibusque exceptis; ramis pallidis, griseis vel brunneis; foliis subcoriaceis, oblongis, 16 ad 20 cm longis, apice acuminatis, basi acutis vel leviter acuminatis, in sicco brunneis, utrinque nitidis, nervis utrinque circiter 8, prominentibus, anastomosantibus, nervis reticulisque densis, validis; inflorescentiis femineis axillaribus, racemosis, pubescentibus; fructibus ut videtur globosis, circiter 5 cm diametro, obtusis vel apiculatis, extus densissime ferrugineo-velutinis vel pubescentibus, calycis lobis 4, accrescentibus, plus minus connatis, dense ferrugineo-pubescentibus, patulis vel reflexis, vix imbricatis, acuminatis, 1 ad 1.5 cm longis.

A tree, glabrous except the infloresence. Branches usually pale, light-gray or brownish, glabrous, the ultimate branchlets sometimes somewhat ferruginous-pubescent. Leaves subcoriaceous, oblong, 16 to 20 cm long, 4.5 to 7 cm wide, glabrous and shining on both surfaces, usually brown when dry, the apex distinctly acuminate, base acute or somewhat acuminate; nerves about 8 on each side of the midrib, distinct, anastomosing, the secondary nerves and reticulations distinct, close. Flowers unknown, but the pistillate inflorescence axillary, racemose, densely pubescent, the racemes in fruit 1.5 to 3 cm long, usually bearing but one or two fruits, the pedicels stout, about 5 mm long. Fruit apparently globose, about 5 cm in diameter, rounded or apiculate, outside densely ferruginous-velvety when young, pubescent when old, about 5-celled. Calyx persistent, accrescent, spreading in young fruits, reflexed in mature ones, 3 to 4 cm in diameter, 4-lobed, the lobes united for the lower third, ovate, coriaceous, acuminate, 1 to 1.5 cm long, densely ferruginous-pubescent.

LUZON, Province of Rizal, Bosoboso, *For. Bur. 3071 Ahern's collector*, May, 1905; Pilea, *Bur. Sci. 3298 Ramos*, June, 1907, both with immature fruits: Province of Tayabas, Lucban, *Elmer 9110*, May, 1907, distributed as *Diospyros discolor* Willd.

A very distinct species, possibly allied to *D. discolor* Willd., but at once distinguished by its glabrous leaves and its connate acuminate calyx-lobes which are not at all imbricate but spreading or reflexed, while its general appearance is quite different from Wildenow's species. The specimen collected by Elmer probably had nearly mature fruits, but the sheet before me has only some fragments of the fruit, so that it is impossible to give a full description at the present time. It is known in Rizal Province as *Talong-gubat*.

Diospyros buxifolia (Blume) Hiern Monog. Eben. (1873) 218.

Leucoxylum buxifolium Blume Bijdr. (1826) 1169; Choisy Mém. Ternstr. (1855) 43, *t. 2;* Miq. Fl. Ind. Bat. **2** (1858) 1050.

Diospyros microphylla Bedd. Ic. Pl. Ind. Or. (1871) 27, *t. 133;* Clarke in Hook. f. Fl. Brit. Ind. **3** (1882) 559; King & Gamble in Journ. As. Soc. Beng. **74**[2] (1905) 210.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9435 Whitford & Hutchinson,* February, 1908.

The specimen is sterile but agrees closely with the description, with material from Java, and fairly well with specimens from Singapore. New to the Philippines.

Southern India to the Malay Peninsula, Andaman Islands, Sumatra, Java, and Borneo.

Diospyros curranii nom. nov. § *Paralea.*

Diospyros reticulata Elm. Leafl. Philip. Bot. 2 (1908) 506, non Willd. nec. Sieber, nec Wall.

Arbor glabra vel subglabra, 7 ad 20 m alta; ramis teretibus, griseis vel brunneis, glabris, vel junioribus plus minus pubescentibus; foliis glabris, lanceolatis, elliptico-lanceolatis vel oblongo-lanceolatis, 10 ad 18 cm longis, 2.5 ad 5 cm latis, basi acutis vel acuminatis, apice acuminatis, subcoriaceis, nervis utrinque 9 ad 15, anastomosantibus, nervulis reticulisque prominentibus; floribus masculinis 4- rariter 5-meris, in cymulis brevibus axillaribus dispositis, staminibus circiter 18; floribus femineis axillaribus, solitariis vel fasciculatis, 4- meris, pubescentibus, calycis lobis ovatis, reflexis, accrescentibus; ovario 3- vel 4-loculare; fructibus ovoideis, 1.5 cm longis.

A tree 7 to 20 m high, glabrous or nearly so. Branches glabrous, terete, brownish or grayish, the branchlets sometimes somewhat ferruginous-pubescent. Leaves lanceolate to elliptic-lanceolate or oblong-lanceolate, 10 to 18 cm long, 2.5 to 5 cm wide, chartaceous to subcoriaceous, shining, pale, greenish or yellowish when dry, entire, the base acute or somewhat acuminate, eglandular, the apex acuminate; nerves 9 to 15 on each side of the midrib, anastomosing, rather distinct but scarcely more prominent than are the secondary nerves and rather dense reticulations; petioles 1.5 cm long or less, sometimes as short as 0.5 cm. Staminate flowers in short, axillary, solitary or fascicled, 1 to 2 cm long cymes, which are slightly pubescent. Calyx lobes 4, rarely 5, ovate to broadly ovate, acute or acuminate, about 1.5 mm long, with short, appressed, scattered, black hairs; stamens about 18, 2-seriate, inserted on the base of the corolla; filaments 1 to 1.5 mm long; anthers lanceolate, acuminate, glabrous, nearly 2 mm long; corolla (immature) 5 mm long, the outside with black appressed hairs. Pistillate flowers axillary, solitary or fascicled, shortly pedicellate, the pedicels and calyx somewhat ferruginous-pubescent: calyx-lobes 4, nearly free, ovate, about 7 mm long, 5 mm wide, obtuse, subfoliaceous, the margins reflexed, the base subcordate, somewhat accrescent and persistent in fruit; corolla about 6 m long, the lobes ovate, 3 mm wide, slightly united below; staminodes about 10; ovary narrowly ovoid, ferruginous-pubescent; style short, 2-cleft. Fruit ovoid, 1.5 cm long, when young more or less ferruginous-pubescent, ultimately glabrous, the calyx-lobes somewhat accrescent, their margins reflexed.

LUZON, Province of Rizal, Bosoboso, *For. Bur. 10034 Curran,* February, 1908; Antipolo, *Merrill 1654, 2675* March, June, 1903, *For. Bur. 448 Ahern's collector,*

April, 1904, *Bur. Sci. 2192 Ramos,* March, 1907: Province of Tayabas, Guinayangan, *Merrill 2029;* Lucban, *Elmer 9241* (type); Atimonan, *For. Bur. 6623 Reyes, For. Bur. 10294, 10662 Curran:* Province of Camarines, Mount Isarog, *For. Bur. 10452 Curran:* Province of Sorsogon, *For. Bur. 5165 Bridges.* MARINDUQUE, *For. Bur. 12182 Rosenbluth.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens,* June, 1906: District of Davao, Santa Cruz, *Williams 2861.*

In the above description the chief additions to that given by Mr. Elmer are of the staminate and pistillate flowers, as the type of the species, *Elmer 9241,* was with fruit only, although nearly all the above specimens have long been available for description. Many of the specimens cited above have abnormal, much-branched, often leafy inflorescences, probably due to the work of some insect: these abnormal inflorescences apparently never bear normal flowers. Similar ones are found in *Canarium,* the form of *C. villosum* described by Engler as *C. luxurians* var. *monstrosum,* and in some species of *Eugenia.*

Local names given for this species are *Malagaitmon, Alinao, Anang, Bolongeta, Panigilman,* and *Bagnito,* many of which are also applied to other species of the genus, although of the above, *Malagaitmon* seems to be rather consistently applied to the present species.

Diospyros everettii sp. nov.

Arbor glabra vel subglabra; foliis oblongis vel oblongo-lanceolatis, subcoriaceis, in sicco brunneis, usque ad 15 cm longis, apice acuminatis, basi late rotundatis subcordatisque, nervis utrinque circiter 10, ascendentibus, anastomosantibus, reticulis laxis; floribus femineis fasciculatis, axillaribus, sessilibus, 4-meris, circiter 22 mm longis, calycis lobis lanceolatis; staminodeis glabris, 4; ovario dense hirsuto.

A tree glabrous or subglabrous. Branches dark-colored, glabrous. Leaves alternate, oblong or oblong-lanceolate, subcoriaceous, brownish when dry especially beneath, the upper surface dull, the lower slightly shining, glabrous, the apex acuminate, the base rather broad, rounded and subcordate, 8 to 15 cm long, 2.5 to 4.5 cm wide; nerves about 10 on each side of the midrib, ascending, attenuate-anastomosing, the reticulations lax; petioles stout, about 3 mm long. Pistillate flowers axillary, sessile, fascicled, just before opening 22 mm long. Calyx cleft nearly to the base into four, lanceolate, spreading, acute or acuminate lobes 7 to 8 mm long, 2.5 mm wide, their margins slightly ciliate. Corolla salver-shaped, the tube cylindric, 9 mm long, 4 mm thick below and slightly contracted above, inside glabrous, outside with very few long hairs; lobes 4, spreading, elliptic-oblong, 12 mm long, 6 mm wide. Staminodes 4, their filaments 2.5 mm long, the anther-like portion 1.5 mm long, glabrous. Ovary densely covered with very stiff, 2 to 3 mm long, brownish hairs; style stout, cylindric, 6 mm long, pubescent, 4-cleft at the apex. The ovary is apparently 8- or 10-celled.

NEGROS, Mount Silay, *For. Bur. 7261 Everett,* May 9, 1907, in ridge forests at an altitude of about 650 m.

A species apparently belonging to the section *Ermellinus,* and is well characterized by its leaves being rounded and subcordate at the base, and by its comparatively large, axillary, fascicled, 4-merous flowers, and the very numerous, stiff, brown hairs that entirely cover the ovary.

Diospyros foveo-reticulata sp. nov.

Arbor inflorescentiis fructibusque exceptis glabra, circiter 20 m alta; foliis subcoriaceis vel coriaceis, oblongis, elliptico-oblongis vel oblongo-lanceolatis, usque ad 30 cm longis, utrinque nitidis, dense foveo-reticulatis, subtus pallidioribus, basi 2-glandulosis, acuminatis, basi acutis, rariter rotundatis; fructibus axillaribus, solitariis, pedunculatis, ovoideis vel subglobosis, 8- vel 10-locellatis junioribus 2 ad 2.5 cm diametro, pallidis, ferrugineo-pubescentibus, pericarpio coriaceo; calycis lobis 4, reflexis, ovatis, crassis, acutis vel obtusis, utrinque ferrugineo-pubescentibus, circiter 8 mm longis.

A glabrous tree, except the inflorescence and fruits, about 20 m high. Branches dark-colored, terete, the branchlets paler, sometimes yellowish, glabrous or minutely puberulent. Leaves alternate, subcoriaceous or coriaceous, oblong, elliptic-oblong, or oblong-lanceolate, rather pale when dry, frequently yellowish, 15 to 30 cm long, 4 to 9 cm wide, glabrous, shining on both surfaces and densely foveolate-reticulate, the apex short-acuminate, the base acute, sometimes rounded, the lower surface near the base with a rather prominent gland on each side of the midrib; primary lateral nerves 10 to 12 on each side of the midrib, indistinct, faintly anastomosing; petioles 1 to 1.5 cm long. Fruit (immature) axillary, solitary, ovoid or subglobose, 2 to 2.5 cm in diameter, pale, the pericarp crustaceous, thin, deciduously ferruginous-pubescent, 8- or 10-celled, the calyx persistent, accrescent, 4-lobed, the tube very short, the lobes very thick, crustaceo-coriaceous, ovate, reflexed, about 8 mm long and nearly as wide, acute or obtuse, densely ferruginous-pubescent on both sides.

LUZON, Province of Camarines, Pasacao, *Ahern 29, 278* (type), *790*, January to June, 1902, the last two with immature fruits; Lupi, *For. Bur. 10780 Curran*, July, 1908, sterile. MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9062 Whitford & Hutchinson*, December, 1907; San Ramon, *Hallier s. n.*, February, 1904, with immature fruits.

This species is well characterized by its densely foveolate-reticulate leaves which are prominently 2-glandular on the lower surface near the base, and by its thickned, ovate, reflexed, 4-lobed calyx which is densely ferruginous-pubescent, as are the young fruits. The plants under Ahern's name, cited above, were erroneously distributed as *Diospyros discolor*, to which the present species is not closely allied. It is known in the Camarines as *Alahan*, and at Port Banga as *Palo negro*. The section is undeterminable from the material available.

Diospyros inclusa sp. nov.

Arbor glabra, circiter 15 m alta; foliis coriaceis vel subcoriaceis, oblongis vel elliptico-oblongis, glabris, nitidis, apice breviter obtuse acuminatis, basi acutis, circiter 9 cm longis, eglandulosis, nervis utrinque circiter 7, vix distinctis, reticulato-anastomosantibus; fructibus axillaribus, solitariis, pedunculatis, depresso-globosis, nigris, apiculatis, glabris vel parce adpresso-hirsutis, 1 cm diametro, circiter 8-locellatis, calyce accrescente, ellipsoideo, crasso, lenticellato, nigro, glabro, breviter 4- vel 5-lobato inclusis.

A glabrous tree about 15 m high. Branches terete, light-gray, glabrous, shining, somewhat striate when dry, the branchlets dark-colored, their tips slightly pubescent. Leaves coriaceous or subcoriaceous, oblong or elliptic-oblong, glabrous, shining on both surfaces, 7 to 10 cm long, 3 to 4.5 cm wide, the apex shortly and obtusely acuminate, the base acute, eglandular; primary lateral nerves about 7 on each side of the midrib, not very distinct, irregular, anastomosing, the secondary ones and reticulations nearly as prominent; petioles black, glabrous, about 6 mm long. Flowers unknown. Fruits axillary, solitary, on stout, 3 to 4 mm long peduncles which are usually spreading, sometimes recurved, quite inclosed by the accrescent calyx, including the calyx ellipsoid or ovoid, 1.5 to 2 cm long. Calyx black, glabrous, shining, lenticellate, thickly crustaceous, inside pubescent, the apex shortly and obscurely 4- or 5-lobed, the opening at the top about 6 mm in diameter. Fruit free from the calyx except at the base, depressed-globose, black, shining, glabrous or with few appressed hairs, about 1 cm in diameter, apex apiculate, usually 8-celled.

MASBATE, Aroroy, *Whitford 1682*, October, 1906, on hillsides at an altitude of about 240 m. Locally known as *Bantolinao*.

A most characteristic species, recognizable by its accrescent, ellipsoid or ovoid, crustaceous, lenticellate calyx which entirely incloses the fruit, except for the small opening at the apex. The section is uncertain, as flowers are necessary to determine it.

Diospyros mindanaensis sp. nov. § *Melonia*.

Arbor glabra 15 ad 25 m alta; foliis oblongis vel oblongo-lanceolatis, coriaceis vel subcoriaceis, glabris, nitidis, apice acuminatis, basi rotundatis, acutis vel leviter acuminatis, usque ad 25 cm longis; floribus femineis racemosis, racemis axillaribus, paucifloris, calycibus breviter 4-dentatis; fructibus globosis, vel depresso-globosis, circiter 4 cm diametro, 4-locellatis, glabris, nitidis, calycibus accrescentibus persistentibus, crasse coriaceis, reflexis, tubo acuminate 4-angulato, breviter 4-dentato; seminibus osseis, albumine ruminato.

A glabrous or subglabrous tree, 15 to 25 m high. Branches terete, glabrous, dark-gray. Leaves alternate, coriaceous or subcoriaceous, oblong or oblong-lanceolate, 10 to 25 cm long, 4 to 8 cm wide, glabrous, the upper surface shining, the lower somewhat paler, dull, apex acuminate, base rounded, acute or sometimes slightly acuminate, eglandular; nerves 10 to 13 on each side of the midrib, rather distinct beneath, somewhat arched-ascending, anastomosing, the secondary nerves distinct, the reticulations fairly dense; petioles stout, 1 to 1.5 cm long. Pistillate flowers 4-merous, in axillary, solitary, few-flowered racemes, the racemes (when young), about 2 cm long, glabrous or with few, scattered, appressed hairs. Calyx cup-shaped, shortly 4-toothed. Fruit globose or depressed-globose, 3 to 4.5 cm in diameter, glabrous, shining, yellowish when mature, the pericarp crustaceous, thick, 8-celled, 8-seeded, the seeds ellipsoid, somewhat compressed, 2 cm long, 1.5 cm wide, brown outside,

the albumen bony, ruminate. The persistent calyx is accrescent, thickly coriaceous, glabrous, reflexed, forming an acuminately 4-angled tube 1 to 1.5 cm long, and diagonally 2 to 2.5 cm in diameter, with four short, acute or acuminate teeth, one at each corner. The side-walls of the calyx-tube are concave, so that the apex of the reflexed calyx-tube is formed of four lobes radiating from the center to the corners of the tube. The peduncle is about 2 cm long in mature fruits.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9453* (type), *9175 Whitford & Hutchinson*, January, February, 1908, with mature fruits. BASILAN, San Rafael, *For. Bur. 6098 Hutchinson*, January, 1907, with mature fruits. NEGROS, Gimagaan River, *For. Bur. 4243, 4269 Everett*, April, May, 1906, the former with abnormal inflorescence, the latter with immature flowers; Cadiz, *For. Bur. 4309 Everett, For. Bur. 7407 Danao*, June 1906, 1907, the former with abnormal inflorescence, the latter sterile. LUZON, Province of Tayabas, Guinayangan, *Merrill 2007* March, 1903, with immature fruits.

This species is well characterized by its comparatively large, 8-celled, 8-seeded fruits, its ruminated albumen, and especially by its persistent calyx which forms an acuminately 4-angled, reflexed tube. It is apparently allied to the Bornean *Diospyros korthalsiana* Hiern, but has much larger leaves, and a quite different calyx-tube. In some respects it resembles *D. subrigida* Hochr., but is quite distinct from that species. Like *D. curranii* Merr. this species frequently has an abnormal, densely much branched inflorescence, apparently due to the work of insects. It is known in Negros as *Ata-ata*, in Tayabas as *Anang*, and in Basilan as *Bolongita*.

Diospyros montana Roxb. Pl. Coromend. 1 (1795) 37, *t. 48;* Hiern Monog. Eben. (1873) 220.

LUZON, Province of Nueva Ecija, near Cabanatuan, *Bur. Sci. 5266 McGregor*, September, 1908.

A species not previously found in the Philippines, the above specimen agreeing rather closely with the form considered by Hiern as the variety *cordifolia*, except that the leaves are not cordate.

India to the Moluccas and northern Australia.

Var. **parva** var. nov.

Differt a typo foliis multo minoribus, 1 ad 2.5 cm longis, subtus dense molliter pubescentibus; fructibus globosis, junioribus 8 mm diametro, glabris, nigris, apiculatis, 8-locellatis; calycis lobis accrescentibus, retrorsis.

LUZON, Province of Ilocos Norte, Badoc, *For. Bur. 13953 Merritt & Darling*, November, 1908, on rocky hillsides at an altitude of about 65 m. Il., *Antinagam.*

Well characterized by its small densely pubescent leaves; additional material may show it to be worthy of specific rank.

Diospyros phanerophlebia sp. nov.

Arbor 5 ad 10 m alta, glabra, inflorescentiis exceptiis; foliis crasse coriaceis, oblongis vel oblongo-lanceolatis, nitidis, basi acutis, subtus 2-glandulosis, apice obtusis vel leviter obtuso-acuminatis, usque ad 20 cm longis; nervis utrinque 8 ad 10, subtus prominentibus, elevatis,

curvato-ascendentibus, anastomosantibus, reticulis laxis, prominentibus, elevatis; petiolo crasso, 1 ad 1.5 cm longo; fructibus ovoideis vel depresso-globosis, solitariis vel binis in axillis defoliatis, in sicco nigris, glabris, nitidis, 1.5 ad 1.8 cm diametro, 8-locellatis, locellis monospermis.

A tree 5 to 10 m high, glabrous except the inflorescence. Branches terete, grayish, the younger ones slender, black, dark-brown, or olivaceous, smooth. Leaves thickly coriaceous, oblong, oblong-lanceolate, rarely lanceolate, 15 to 20 cm long, 4 to 8 cm wide, of about the same color on both surfaces or the lower slightly paler, the upper shining, the apex obtuse or slightly and obtusely acuminate, the base acute, margins often slightly revolute, the lower surface with a distinct gland at the base on each side of the petiole; primary nerves 8 to 10 on each side of the midrib, very prominent on the lower surface, elevated, curved-ascending, anastomosing, the primary reticulations lax, nearly as prominent as the nerves, the ultimate reticulations less distinct; petioles stout, black when dry, 1 to 1.5 cm long. Flowers unknown. Fruit solitary or in pairs in the axils of fallen leaves, subsessile, numerous, ovoid or depressed-globose, 1.5 to 1.8 cm in diameter, black and shining when dry, glabrous, the apex slightly apiculate, 8-celled, each cell with a single seed. Calyx accrescent, closely appressed to the base of the fruit, more or less pubescent outside, densely so within, nearly square and subtruncate, or with four short, broad teeth, 1.2 to 1.5 cm wide at the top. Seeds about 8 mm long, 5 mm wide, compressed, brown, shining, smooth, the albumen not ruminate.

Type specimen collected by *H. M. Curran, For. Bur. 10993*, District of Bontoc, Luzon, January, 1909, locally known as *Aliuac.* I am disposed to refer to it also the following specimens, all from Luzon: Province of Bulacan, *For. Bur. 7172 Curran*, June, 1907: Province of Rizal, San Mateo, *For. Bur. 1847 Ahern's collector; Merrill 236*, Decades Philippine Forest Flora: Province of Laguna, Santa Maria Mavitac, *For. Bur. 10052 Curran*, locally known in the last three provinces as *Canomoi.*

A species well characterized by its very prominent veins and reticulations, manifestly allied to *Diospyros maritima* Blume, and to *D. canomoi A. DC.*, differing especially from the former in its much thicker leaves and very prominent nerves, and from the latter in being nearly glabrous throughout.

Diospyros whitfordii sp. nov.

Arbor circiter 18 m alta; ramulis junioribus densissime ferrugineo-pubescentibus; foliis coriaceis vel subcoriaceis, oblongis vel elliptico-oblongis, 8 ad 18 cm longis, breviter acuminatis, basi rotundatis vel obtusis, utrinque nitidis, supra glabris, subtus glabris vel ad costa pubescentibus; fructibus globoso-ovoideis, 5 cm diametro, extus nigris, plus minus pruinosis, glabris, in sicco plus minus reticulato-rugosis, pericarpio osseo vel ligneo; calycibus persistentibus, accrescentibus, 5-lobatis, 4.5 ad 5 cm diametro, crasse coriaceis, lobis triangulari-ovatis, acutis, vix reflexis, utrinque densissime ferrugineo-pubescentibus.

A tree about 18 m high. Branches glabrous, grayish-brown, sometimes pruinose, the younger branchlets densely ferruginous-pubescent. Leaves coriaceous or subcoriaceous, oblong or elliptic-oblong, 8 to 18 cm long, 3 to 6 cm wide, the apex shortly acuminate, the base rounded or obtuse, both surfaces shining, the upper one glabrous, the lower glabrous or more or less pubescent on the midrib; nerves 6 to 8 on each side of the midrib, not very prominent, anastomosing, the secondary ones and the reticulations distinct on the lower surface, rather close; petioles 8 to 10 cm long, more or less pubescent. Fruit ovoid-globose, about 5 cm in diameter, the pericarp bony or woody, outside black, more or less pruinose, reticulate-rugose when dry, glabrous, the persistent, 5-lobed calyx appressed to the base of the fruit, 4.5 to 5 cm in diameter, the lobes united for half their length, triangular-ovate, spreading, acute, thickly coriaceous or almost woody, both sides densely ferruginous-pubescent. The central portion of the calyx is depressed, the depression extending along the median portions of the lobes, while there are five prominent protuberances at the juncture of the lobes.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9019 Whitford*, November, 1907, in fruit; Ayala, *For. Bur. 4811 Hutchinson*, July, 1906, sterile. On forested ridges at an altitude of about 30 m, locally known as *Camagon*. The fruit is immature and is described by Whitford as green.

OLACACEÆ.

LINOCIERA Swartz.

Linociera acuminatissima sp. nov.

Arbor glabra, circiter 9 m alta, ramis ramulisque teretibus, pallidis; foliis coriaceis, nitidis, oblongo-ellipticis, basi acuminatis, apice valde caudato-acuminatis, margine plus minus recurvatis; inflorescentiis racemosis, axillaribus, racemis solitariis, paucifloris, 2 ad 3 cm longis; floribus circiter 4 mm longis.

A tree, glabrous throughout, about 9 m high. Branches and branchlets slender, terete, pale-gray, sparingly lenticellate. Leaves opposite, coriaceous, somewhat shining, oblong-elliptic, 8 to 12 cm long, 2.5 to 4 cm wide, olivaceous above when dry, brownish and paler beneath, the base somewhat acuminate, the apex rather strongly caudate-acuminate, the acumen 1.5 to 2 cm long, slender, narrowed upward, blunt, the margins somewhat recurved; nerves about 7 on each side of the midrib, indistinct, distant, obscurely anastomosing, the reticulations obsolete; petioles 1 to 1.5 cm long. Racemes axillary, solitary, 2 to 3 cm long, few-flowered, the pedicels stout, 1 to 4 mm long, the bracteoles narrowly oblong or lanceolate, obtuse or rarely acuminate, about 2 mm long. Calyx-lobes broadly ovate, acute, 1 mm long. Corolla-lobes lanceolate, obtuse, 4 mm long, somewhat connate below. Stamens 2, the filaments broad, short; anthers elliptic, 1 mm long.

PALAWAN, Malampaya Bay, *For. Bur. 4506, 7454 Curran*, June 21, 1906.

Well characterized by its caudate-acuminate leaves.

Linociera philippinensis nom. nov.

Mayepea pallida Merr. in Govt. Lab. Publ. (Philip.) **35** (1906) 58.

Linociera pallida Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 116, non K. Sch.

Olea sp. Vidal Phan. Cuming. Philip. (1885) 125; Rev. Pl. Vasc. Filip. (1886) 181.

The above change of name is necessitated because of the previous use of the name *pallida* for a different species of the same genus, by K. Schumann. I also include under this species the specimens referred by Vidal to *Olea* sp. in Phan. Cuming. Philip. (1885) 125; Rev. Pl. Vasc. Filip. (1886) 181, as the specimens cited appear to me to be *Linociera* and not *Olea*. *Linociera philippinensis* is represented by the following specimens:

LUZON, Province of Bataan, Mount Mariveles, *For. Bur. 2792 Meyer, For. Bur. 2939 Borden, Whitford 1142, Williams 569:* Province of Rizal, *Merrill 1835, 2670, For. Bur. 2874 Ahern's collector, Bur. Sci. 1457, 3356 Ramos:* Province of Camarines Sur, Pasacao, *Ahern 44:* Province of Zambales, *For. Bur. 6942 Curran.* MINDORO, Pola, *Merrill 2255.* GUIMARAS, *For. Bur. 267, 280, 309 Gammill.* Native names, T., *Anatao, Malabocboc, Pulat;* V., *Magubay, Cabating.*

APOCYNACEÆ.

ALIXIA Banks.

Alyxia luzoniensis sp. nov.

Frutex scandens, glabra; foliis oppositis, ternis, vel rariter quarternis, oblongis, ovato-oblongis, vel elliptico-oblongis, coriaceis, nitidis, usque ad 5 cm longis, apice breviter obtuse acuminatis, basi acutis, nervis lateralibus subobsoletis; cymis axillaribus, paucifloris, pedunculatis; fructibus ellipsoideis, obtusis vel apiculatis, 1 ad 1.4 cm longis.

A scandent shrub, glabrous throughout. Branches terete or slightly angled, brownish, rather slender. Leaves opposite, mostly ternate, or rarely quaternate, oblong, ovate-oblong, or elliptic-oblong, coriaceous, shining, 2 to 5 cm long, 1 to 2 cm wide, the apex shortly and obscurely blunt-acuminate, the base acute, margins slightly recurved; midrib prominent, the lateral nerves nearly obsolete, very slender; petioles 1 to 2 mm long. Cymes axillary, solitary, few-flowered, the peduncles 1 to 1.5 cm long, the buds congested, calyx-segments about 1 mm long. Flowers unknown. Fruits ellipsoid, glabrous, obtuse or apiculate, 1 to 1.4 cm long, about 8 mm thick, very rarely the carpel is constricted in a moniliform manner, bearing above the constriction a second seed-bearing portion.

LUZON, Province of Ilocos Norte, Mount Piao, *For. Bur. 13977, 13988 Merritt & Darling,* altitude 1,000 m; Vintar, *For. Bur. 13945 Merritt & Darling:* District of Bontoc, *Bur. Sci. 7007 Ramos* (type): Province of Zambales, Mount Tapulao, *For. Bur. 8069 Curran & Merritt, Bur. Sci. 5107 Ramos,* altitude 2,000 m.

This species is apparently most closely allied to *Alyxia sinensis* Champ., of southern China, but seems to be quite distinct from that, as well as from the previously described Philippine forms. It is apparently also closely allied to **Alyxia parvifolia** (*Gynopogon parvifolia* Merr.), but has much larger and differently shaped leaves. It is at once distinguishable from *A. monilifera* Vidal by its very different fruit, and practically nerveless leaves. Like the other Philippine species of the genus dried specimens have a strong odor of cumarin.

CHONEMORPHA G. Don.

Chonemorpha elastica sp. nov.

Frutex alte scandens, ramis ramulisque rubro-brunneis, glabris; foliis membranaceis vel submembranaceis ovato-ellipticis vel obovato-ellipticis, 15 ad 20 cm longis, breviter acuminatis, basi rotundatis, subtus plus minus pilosis; floribus albis, 2.5 ad 3 cm diametro; calycibus 5-partitis.

A scandent shrub of large size. Branches and branchlets reddish-brown, glabrous, usually shining. Leaves opposite, membranaceous or submembranaceous, ovate-elliptic or obovate-elliptic, 15 to 20 cm long, 8 to 15 cm wide, entire, the base rather broad, rounded, the apex shortly acuminate, the upper surface glabrous, slightly shining, the lower surface slightly paler and somewhat pilose; petioles rather slender, 2.5 to 4 cm long; nerves about 10 on each side of the midrib, distinct on both surfaces, the reticulations very distinct beneath. Cymes terminal, few-flowered, about 6 cm long, glabrous or nearly so, the bracteoles more or less pubescent, about 3 mm long. Flowers white, fragrant, their pedicels slender, 1 cm long or less. Calyx 5-partite, the lobes oblong, somewhat acuminate, the margins above somewhat ciliate, about 5 mm long, 2 mm wide, united below. Corolla-tube 9 to 10 mm long, swollen and about 3 mm in diameter in the lower third, contracted above, glabrous outside, inside with reflexed hairs below the insertion of the stamens; lobes 5, obliquely obovate, spreading, about 15 cm long, 12 mm wide. Stamens 5, the filaments short, inserted at about the lower one-fourth of the tube; anthers narrowly-lanceolate, acuminate, 4 mm long, sagittate at the base. Disk entire, truncate, 1 mm high. Ovaries and style 4 mm long, the ovaries two, free, united by the style; ovules many. Fruit unknown.

MINDANAO, District of Zamboanga, Dumanquilas Bay, Tigbalubu, *For. Bur. 12351 Hutchinson*, May, 1908, in forests at an altitude of about 40 m: District of Davao, *H. S. Peabody*, July, 1906, leaves only. BASILAN, *P. L. Sherman*, July, 1903, leaves only; also reported from Mindanao and from Tawi-Tawi by Sherman.

So far as is known at present this is the most important rubber producing vine in the Philippines. It is one of the two species considered by P. L. Sherman in his paper on "Gutta-Percha and Rubber in the Philippine Islands,"[12] and an illustration is given by him, l. c. *fig. 33*, of leaf specimens collected on Basilan Island. This specimen, as well as the one collected by Mr. Peabody, cited above, were previously provisionally identified as *Chonemorpha*, but the determination could not be verified until flowering specimens were received. Mr. Sherman reports this vine from Mindanao, Basilan, and Tawi-Tawi, but states that only the natives of Tawi-Tawi understand the commercial value of the product, and that they gather the latex and mix it with gutta-percha. No information is at hand as to the amount exported, but it is probably very small. According to Mr. Sherman's notes, the vine attains a length of from 150 to 200 feet, and a diameter of from 6 to 8 inches.

Apparently allied to *Chonemorpha griffithii* Hook. f., of British India, especially in its deeply cleft calyx, but the branches not hispid. Without comparison with the type of Hooker's species, it is impossible to give other differential characters, as Hooker's description is too short and imperfect.

[12] *Publications of the Bureau of Government Laboratories*, **7** (1903), 36–39.

KICKXIA Blume.

Kickxia merrittii sp. nov.

Arbor glabra, 18 ad 20 m alta; foliis oppositis, subcoriaceis, oblongo-vel elliptico-lanceolatis, utrinque acuminatis, 7 ad 12 cm longis, usque ad 3.5 cm latis; floribus albis, axillaribus, solitariis vel binis, pedicellatis, 7 cm longis, corollae tubo 2.5 cm longo.

A tree 18 to 20 m high, glabrous throughout. Branches terete, lenticellate, dark-reddish-brown, the branchlets slightly compressed. Leaves opposite, subcoriaceous, oblong-lanceolate or elliptic-lanceolate, 7 to 12 cm long, 2 to 3.5 cm wide, entire, shining, the apex acuminate, acumen blunt, the base acuminate; nerves about 7 on each side of the midrib, beneath rather distinct and often reddish-brown; petioles 1 cm long or less. Flowers axillary, solitary or in pairs, white, about 7 cm long, the pedicels 2 cm long or less. Calyx-lobes oblong-ovate, acuminate, keeled, 5 mm long, 3 mm wide. Corolla-tube 2.5 cm long, narrow below, somewhat inflated above, the lobes 5, about 4 cm long, 1.3 cm wide. Anthers about 7 mm long. Disk 2 mm long, truncate. Ovaries elongated, united by the style, the latter 8 mm long. Follicles (immature) cylindric, 8 cm long, about 2 cm thick, seeds spindle-shaped, long acuminate, about 4 cm long, the hairs brownish, 4 cm long.

MINDORO, Ibalo River, *For. Bur. 11488 Merritt*, May 9, 1908, in mountain forests at 600 m altitude. Mang., *Ayete*.

The second species of the genus to be found in the Philippines, distinguished from *Kickxia blancoi* Rolfe by its elongated corolla tube, and more acuminate leaves.

OCHROSIA Juss.

Ochrosia littoralis sp. nov.

Arbor circiter 10 m alta, glabra; foliis ternis vel quaternis, membranaceis, late oblanceolatis, breviter obtuseque acuminatis, basi cuneatis, usque ad 8 cm longis; cymis axillaribus terminalibusque, 2 ad 3 cm longis; floribus circiter 1 cm longis; drupis 2.5 ad 4 cm longis, divergentibus, acuminatis, subcylindraceis, basi connatis.

A tree about 10 m high, glabrous throughout. Branches slender, terete, reddish-brown. Leaves usually ternate, rarely quaternate, membranaceous, broadly oblanceolate, 6 to 8 cm long, 2 to 2.5 cm wide, shining, the apex shortly and obtusely acuminate, the base cuneate; nerves very numerous, parallel, not prominent; petioles 4 to 5 mm long, sometimes shorter. Cymes axillary and terminal, 2 to 3 cm long, the bracts and bracteoles ovate, 1 to 1.5 mm long. Flowers mostly at the apices of the branchlets, usually crowded. Calyx-lobes ovate to oblong-ovate, obtuse or acute, imbricate, about 2 mm long. Corolla-tube cylindric, slender, about 6 mm long, 1.5 mm in diameter, glabrous throughout, the lobes 5, narrow, about 4 mm long, overlapping to the right. Stamens inserted just above the middle of the tube; anthers lanceolate, acuminate, 1.3 mm long. Ovaries two, united at the base, and at the apex by the 2

mm long style; ovules 6 to 8 in each. Drupes united at the base, divaricate, the pericarp bony, the mesocarp corky, subcylindric, 2.5 to 4 cm long, 1 to 1.5 cm in diameter, somewhat acuminate; seeds 6 to 8 in each drupe, 3 or 4 on each side of the placenta, compressed, orbicular, 4 to 6 mm in diameter.

LUZON, Province of Batangas, Malabrigo, *For. Bur. 7754 Curran & Merritt*, November, 1907, along the seashore.

A species well characterized by its ternate leaves, short cymes, and subcylindric, somewhat acuminate drupes, which are not flattened on the inner surface, and by its unusually large number of seeds. The first species of the genus to be found in the Philippines.

RAUWOLFIA Linn.

Rauwolfia samarensis sp. nov.

Arbor glabra, circiter 8 m alta; foliis quarternis, oblongo-ellipticis, breviter acuteque acuminatis vel acutis, chartaceis, circiter 20 cm longis, 6 cm latis, nervis utrinque 30 ad 35; pedunculis e axillis terminalibus, superne umbellatis; baccis ellipsoideis, atropurpureis, circiter 1.5 cm longis, pericarpio carnoso.

A tree about 8 m high, glabrous throughout. Branches light-gray, stout, the leaf-scars very prominent. Leaves in whorls of four, oblong-elliptic, 13 to 20 cm long, 4 to 7 cm wide, the apex shortly and sharply acuminate or acute, the base acute or slightly decurrent-acuminate, chartaceous, shining, the lower surface paler than the upper; primary nerves 30 to 35 on each side of the midrib, distinct, the intermediate secondary ones evident; petioles 1.5 to 3 cm long. Inflorescence from the terminal axils, the peduncles in anthesis about 5 cm long, in fruit elongated and the panicle ultimately about as long as the leaves, the branches umbellately arranged at the apex of the peduncle. Flowers white, umbellately disposed, the pedicles 1 to 2 mm long. Calyx 3 mm long, the lobes obtuse. Corolla 5 mm long, cylindric, the lobes orbicular-ovate, 2 mm long, the throat hirsute. Anthers lanceolate, 1.3 mm long. Style about 1.5 mm long. Fruit ellipsoid, dark-purple when mature, the pericarp fleshy.

SAMAR, Lanang, *Merrill 5233*, October 3, 1906, in thickets on bluffs along the seashore at an altitude of about 10 m.

A species allied to *Rauwolfia spectabilis* (Miq.) Boerl., *R. javanica* Koord. & Valet., and to *R. sumatrana* Jack., of Malaya, but apparently distinct from all. Well characterized by its many-nerved leaves and rather fleshy fruits.

TABERNAEMONTANA Linn.

Tabernaemontana caudata sp. nov.

Arbuscula circiter 2 m alta, glabra; ramis ramulisque gracilibus, pallidis; foliis ovato-lanceolatis vel elliptico-ovatis, usque ad 4 cm longis, basi acutis vel acuminatis, apice valde caudato-acuminatis; floribus paucis axillaribus, cymosis, albis, circiter 12 mm longis, calycis lobis ovatis, 0.5 mm longis.

A shrub about 2 m high, glabrous throughout. Branches and branchlets slender, terete, pale-gray, somewhat shining. Leaves ovate-lanceolate to elliptic-lanceolate, 2.5 to 4 cm long, 1 to 1.5 cm wide, chartaceous or submembranaceous, shining, the base acute or acuminate, sometimes slightly inequilateral, the apex strongly caudate-acuminate, the acumen about one-third as long as the blade, blunt; nerves 6 to 8 on each side of the midrib, faint, spreading, anastomosing, the reticulations very obscure; petioles very slender, about 5 mm long. Flowers in few-flowered, axillary, solitary cymes, but two or three flowers in a cyme, the peduncles very short, the pedicels slender, 1 cm long. Calyx-teeth ovate, blunt, 0.5 mm long. Corolla-tube 12 mm long, slender, the lobes narrowly oblong, 7 mm long, 3 mm wide. Anthers 2 mm long. Carpels narrow, about 2 mm long; styles 10 mm in length. Fruit unknown.

LUZON, Province of Ilocos Sur, Mount Bulangao, *For. Bur. 14025 Merritt & Darling*, November, 1908, in forests at an altitude of about 1,150 m.

A species well characterized by its small, very strongly caudate-acuminate leaves, which do not exceed 4 cm in length, and its few-flowered cymes.

Tabernaemontana linearifolia sp. nov.

Arbuscula glabra, circiter 4 m alta; foliis chartaceis, linearibus vel anguste lanceolato-linearibus, utrinque angustatis, apice gradatim acuminatis, usque ad 7 cm longis, 5 ad 8 mm latis; floribus axillaribus, solitariis, longe pedicellatis; folliculis oblongis, utrinque angustatis acuminatisque, circiter 2.5 cm longis.

A glabrous shrub about 4 m high. Branches and branchlets slender, terete, gray, shining. Leaves linear or narrowly lanceolate-linear, 3 to 7 cm long, 5 to 8 mm wide, chartaceous, somewhat shining, olivaceous above when dry, the lower surface paler and somewhat brownish, narrowed at both ends, the apex gradually acuminate, the base acute; lateral nerves distant, indistinct, spreading, the reticulations obsolete; petioles 2 to 4 mm long. Flowers axillary, solitary, white, their peduncles often 3 cm long, frequently much shorter. Calyx-teeth ovate, acute or obtuse, 1.5 mm long. Corolla-tube 13 mm long, slender, the lobes oblique, acute, about 7 mm long, 3 mm wide. Carpels lanceolate, narrowed above, 3 mm long; styles 6 to 7 mm long. Follicle oblong, orange-yellow, nearly 2.5 cm long, 8 mm in diameter in the middle, acuminately narrowed at both ends, with three faint ridges extending the whole length, the apical portion with five faint ridges; seed solitary, narrowly ellipsoid, 8 mm long, the groove not prominent.

LUZON, District of Lepanto, Mancayan, *For. Bur. 10945 Curran*, January, 1909, in open grass-lands in thin pine forests, altitude 1,600 m.

A species well characterized by its very arrow, elongated, linear or linear-lanceolate leaves, its solitary, frequently long-pediceled flowers, and its one-seeded follicles which are acuminately narrowed at both ends.

Tabernaemontana megacarpa sp. nov.

Arbor circiter 10 m alta, glabra; foliis ellipticis, oblongo-ellipticis, vel obovato-ellipticis, apice rotundatis, basi acutis vel obtusis, 15 ad 35 cm longis, nervis utrinque 20 ad 24, prominentibus; paniculis terminalibus, circiter 20 cm longis; floribus circiter 3.5 cm diametro; fructibus carnosis, laevibus, rubris, in sicco rugosis, griseis, circiter 8 cm longis, 4 cm latis, vix costatis.

A tree about 10 m high, glabrous throughout. Branches and branchlets light-gray, glabrous, stout. Leaves opposite, firmly chartaceous to subcoriaceous, somewhat shining above, dull beneath, elliptic, oblong-elliptic or obovate-elliptic, 15 to 30 cm long, 9 to 15 cm wide, the apex broad, rounded, the base acute or obtuse; nerves 20 to 24 on each side of the midrib, very prominent, the reticulations obsolete or nearly so; petioles about 2 cm long, the base inflated and somewhat clasping the branches. Panicles terminal, about 20 cm long. Calyx-lobes broadly ovate, about 5 mm long. Corolla-tube 2 cm long, the limb spreading, 3 to 3.5 cm in diameter. Follicles smooth and red when fresh, fleshy, when dry strongly wrinkled, gray or brownish, somewhat curved, not costate, about 8 cm long, 4 to 5 cm wide and 3 cm thick. Seeds numerous, 10 to 12 mm long.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*, June, April, and September, 1906: Province of Misamis, Mount Malindang, *For. Bur. 4781 Mearns & Hutchinson*, May, 1906: District of Zamboanga, *Copeland s. n.*, April, 1905; Sax River, *Williams 2179*, February, 1905. BASILAN, *For. Bur. 3964 Hutchinson*, January, 1906; *Hallier s. n.*, January, 1904.

This species is allied to *Vocanga plumeriaefolia* Elmer Leafl. Philip. Bot. 1 (1908) 333, but has relatively broader leaves, and more numerous nerves. The type of *Voacanga plumeriaefolia* Elm., is a fruiting specimen, and so far as I can determine from the material before me, is a *Tabernaemontana*, but flowers are necessary to determine exactly to which genus it really belongs.

Tabernaemontana mucronata sp. nov.

Arbor parva, circiter 6 m alta, glabra; ramis griseis, teretibus, ramulis plus minus angulatis; foliis membranaceis, oblongo-ellipticis, apice acuminatis, acuminibus apiculatis, 6 ad 10 cm longis, 2 ad 4 cm latis, nervis utrinque 9 vel 10; cymes axillaribus, brevibus, solitariis vel fasciculatis, circiter 2 cm longis; floribus gracilibus, circiter 12 mm longis.

A small tree about 6 m high, glabrous throughout. Branches terete, gray, the branchlets somewhat angled. Leaves membranaceous, oblong-elliptic, 6 to 10 cm long, 2 to 4 cm wide, the apex rather prominently acuminate, the acumen apiculate, the base somewhat decurrent-acuminate, the upper surface brownish when dry, dull, the lower slightly paler; nerves 9 or 10 on each side of the midrib, not prominent, the reticulations lax, obscure; petioles about 3 mm long. Cymes axillary, solitary or several in each axil, short, rather congested, including the flowers 2 cm long or less, the peduncles very short, the pedicles about 5 mm long. Calyx-teeth acute, short. Corolla-tube cylindric, very slender,

1 mm or less in diameter, the lobes spreading, 3 or 4 mm long. Fruit unknown.

GUIMARAS, Nagaba, *For. Bur. 304 Gammill*, February, 1904 altitude about 80 m, in thickets and open places. V., *Alibutbut*.

A species with somewhat the appearance of *Tabernaemontana pandacaqui* Poir., but with quite different inflorescence. Readily recognzable by its very short cymes and slender flowers.

Tabernaemontana puberula sp. nov.

Arbuscula vel arbor parva, ramulis petiolis foliis fructibusque plus minus dense puberulis vel pubescentibus; foliis 6 ad 9 cm longis, membranaceis, acuminatis, oblongo-ellipticis; folliculis rubris, ovoideis vel oblongis, 1 ad 2 cm longis, 3- ad 6-spermis.

A shrub or small tree, rather uniformly and softly puberulent or pubescent. Branches slender, terete, grayish-brown, glabrous, the branchlets puberulent. Leaves opposite, oblong-elliptic, puberulent on both surfaces, especially beneath, 6 to 9 cm long, 2.5 to 4 cm wide, membranaceous, the apex shortly acuminate, the base acute; nerves about 10 on each side of the midrib, distinct beneath, the reticulations lax; petioles pubescent, 5 mm long or less. Follicles red, ovoid or oblong, the apex acute, longitudinally 3-ribbed, 1 to 2 cm long, 1 cm wide or less, the pericarp coriaceous, somewhat pubescent. Seeds 3 to 6.

LUZON, Province of Rizal, Morong, *Bur. Sci. 1440 Ramos*, August, 1906, in thickets and open places; Malapadnabato, *Merrill 2725, 2746*, June, 1903.

A species with the general appearance of *Tabernaemontana pandacaqui* Poir., but readily recognizable by its uniform soft pubescence.

VOACANGA Thou.

Voacanga globosa (Blanco) comb. nov.

Tabernaemontana globosa Blanco Fl. Filip. (1837) 116, ed. 2 (1845) 83, ed. 3, 1: 153; Miq. Fl. Ind. Bot. 2 (1856) 424.

Orchipeda foetida Vidal Sinopsis Atlas (1883) 32, *t. 66, f. D;* F.-Vill. Nov. App. (1880) 130, non Blume.

Voacanga cumingiana Rolfe in Journ. Linn. Soc. Bot. 21 (1884) 313; Vidal Phan. Cuming. Philip. (1885) 126; Rev. Pl. Vasc. Filip. (1886) 184; Merr. in For. Bur. Bull. 1 (1903) 49; Philip. Journ. Sci. 1 (1906) Suppl. 117.

LUZON, Province of Benguet, Sablan, *Elmer 6165*, April, 1904: Province of Bataan, Lamao River, Mount Mariveles, *Merrill 3798*, January, 1904, *Whitford 1079*, January, 1905, *For. Bur. 684, 1521, 1755, 2331, Borden*, May to December, 1904, *For. Bur. 2282, 3014 Meyer*, December, May, *For. Bur. 5467 Curran*, November, 1906, *Williams 509*, January, 1904: Province of Cavite, Mendez Nuñez, *Bur. Sci. 1356 Mangubat*, August, 1906: Province of Batangas, Lipa, *Marave 16:* Province of Laguna, Calauan, *Cuming 476;* Los Baños, *Elmer*, April, 1906, *Hallier*, December, 1903; Pagsanjan, *Merrill 2186*, May 1903: Province of Tayabas, Lucena, *Merrill 2887*, June, 1903; Atimonan, *For. Bur. 6704 Kobbe*, April, 1907; *Gregory 108*, August, 1904; Mount Banajao, *Whitford 992*, October, 1904; Gumaca, *Whitford 878*, September, 1904; Binangonan, *Whitford 829*, September, 1904; Mauban, *For. Bur. 10200 Curran*, March, 1908. MINDORO, *Cuming 1500;* Bongabong River, *For. Bur. 4075 Merritt*. MASBATE, *Merrill 3030*. CEBU, For. Bur. *6415 Espinosa*, September, 1906. LEYTE, *Elmer 7103*, January,

1906. MINDANAO, Province of Surigao, *Ahern 330;* District of Davao, *Williams 2941.*

A widely distributed endemic species, for which the earliest valid specific name is here adopted. The type of *Voacanga cumingiana* Rolfe was *Cuming 1806* from Negros, and while it has somewhat smaller leaves than most of the specimens cited above, I consider it to be identical with Blanco's species.

WILLOUGHBYA Roxb.

Willoughbya luzoniensis sp. nov.

Frutex alte scandens, glabra, ecirrhosa; foliis oppositis, firmiter membranaceis vel papyraceis, oblongo-ellipticis, nitidis, utrinque acuminatis, usque ad 9 cm longis, nervis primariis utrinque circiter 12; fructibus ovoideis vel ovoideo-ellipsoideis, glabris, nitidis, circiter 2.5 cm longis; seminibus circiter 1 cm longis.

A scandent shrub without tendrils, glabrous throughout, about 15 m high. Branches slender, terete, grayish-brown, lenticellate, the branchlets slender, somewhat olivaceous. Leaves opposite, oblong-elliptic, 6 to 9 cm long, 2 to 3.5 cm wide, the apex rather prominently acuminate, the base somewhat decurrent-acuminate, shining, firmly membranaceous or papyraceous, pale or brownish when dry; primary nerves about 12 on each side of the midrib, scarcely more distinct than are the secondary ones and the reticulations; petioles 5 mm long or less. Flowers unknown. Berry ovoid or ovoid-elliptical, about 2.5 cm long, and 2 cm in diameter, the pericarp crustaceous, pale, smooth, shining, the peduncle 1 to 1.5 cm long. Seeds irregular, 8 to 10 mm long, strongly and irregularly pitted, in this character sponge-like.

LUZON, Province of Camarines, Caramoan, *For. Bur. 12277 Curran,* June, 1908.

The first species of the genus to be found in the Philippines, characterized by its rather small fruits and its seeds which are sponge-like in appearance, but not in texture.

CONVOLVULACEÆ.

IPOMOEA Linn.

Ipomoea congesta R. Br. Prodr. (1810) 485; Choisy in DC. Prodr. 9 (1845) 369; Benth. Fl. Austr. 4 (1869) 417.

LUZON, Province of Cagayan, *For. Bur. 16622 Curren,* February, 1909. PALMAS (southeast of Mindanao), *Merrill 5353* October, 1906.

Queensland to Polynesia; new to the Philippines.

VERBENACEÆ.

VITEX Linn.

Vitex pentaphylla sp. nov.

Arbor 10 ad 20 m alta; foliis 5-foliolatis, foliolis chartaceis vel membranaceis, ovatis vel elliptico-ovatis, acuminatis, subtus plus minus pubescentibus, vix glandulosis; cymis axillaribus, solitariis, pedunculatis; floribus pubescentibus, calyce regulariter 5-dentato; fructibus nigris, glabris, oblongo-ovoideis, circiter 1 cm longis.

A tree 10 to 20 m high. Branches brownish, glabrous, the young parts sometimes slightly pubescent. Leaves alternate, 5-foliolate, the common petiole 6 to 15 cm long, glabrous or somewhat pubescent: leaflets chartaceous or membranaceous, ovate to elliptic-ovate, petiolulate, 7 to 16 cm long, 4 to 8 cm wide, entire, base acute, apex acuminate, the upper surface glabrous and shining, or the midrib and nerves slightly pubescent, the lower surface slightly paler, more or less pubescent, or ultimately glabrous or nearly so, not at all glandular; nerves 15 to 20 on each side of the midrib, prominent, anastomosing; petiolules 5 to 15 mm long, those of the lateral leaflets the shortest. Cymes axillary, solitary, pedunculate, 10 to 15 cm long, in anthesis more or less pubescent, in fruit nearly glabrous. Flowers purplish, tinged with white, the bracteoles very small. Calyx cup-shaped, somewhat pubescent, about 4 mm long, regularly 5-toothed, the teeth less than 1 mm long, broadly ovate, acute or acuminate. Corolla about 11 mm long, somewhat pubescent outside, the tube 5 to 6 mm long, inflated upwards; middle lobe of the lower lip narrowly obovoid, rounded, crisped, 6 to 7 mm long, densely villous on the median portion inside, the lateral lobes and the upper lip 3 to 4 mm long. Filaments slightly villous below. Ovary ovoid, villous at the apex; style glabrous, 9 mm long. Fruit black when dry, glabrous, oblong-ovoid, rounded at the apex, about 1 cm long, the calyx persistent, accrescent, somewhat saucer-shaped, 6 to 7 mm in diameter.

MINDANAO, District of Zamboanga, Siocon River, *For. Bur. 9490 Whitford & Hutchinson*, February, 1908; *For. Bur. 11245 Hutchinson*, March, 1908. A specimen collected by R. S. Williams, *No. 2949*, in the District of Davao, Mindanao, is probably referable here; it is with mature fruits, and is entirely glabrous.

This species is most closely allied to *Vitex littoralis* Dene.; but is at once distinguishable by its five leaflets which are not at all glandular beneath. It is distinguished from *V. turczaninowii* Merr. by its purplish, not yellow flowers, non-glandular leaves and inflorescence, and other characters. It is locally known as *Malaun aso*, and to the Moros as *Calipapa aso*.

ACANTHACEÆ.

JUSTICIA Linn.

Justicia tenuis sp. nov.

Herba annua, suberecta, diffusa, vel procumbens, usque ad 20 cm alta; foliis membranaceis, ovatis, 1 ad 2 cm longis, acutis vel leviter acuminatis, ramis ramulisque angulatis, plus minus hirsutis; inflorescentiis spicatis, terminalibus axillaribusque, tenuibus; bracteis lanceolatis vel ovatis, acuminatis; calycis segmentis 5, anguste lanceolatis, acuminatis, hyalinis; corolla 2-lobata, lobis imbricatis; seminibus 4, verrucosis.

An annual, suberect, diffuse, or procumbent, rather weak herb, 20 cm high or less. Stems and branches slender, angled, more or less covered with weak white hairs, the leaves also with a few similar ones. Leaves ovate, 1 to 2 cm long, membranaceous, acute or slightly acuminate, the base broad, rounded; petioles very short. Spikes many, slender, short,

axillary, and terminating the branches, 1 to 3 cm long, few-flowered, the flowers distant or close, Flowers blue, the bracteoles paired, the lower pair 2.5 mm long, lanceolate, acuminate, slightly hairy, the upper pair larger, ovate to elliptic-ovate, abruptly acuminate, green with hyaline margins, 3 mm long, 2 mm wide. Sepals 5, free or nearly so, hyaline, lanceolate or narrowly lanceolate, narrowed at both ends, apex slenderly acuminate, more or less ciliate-hairy. Corolla about 5 mm long, blue, the tube short, 1 mm long, glabrous, 2-lobed, lobes imbricate, the larger, outer lobe inclosing the other in bud, 4 mm long, obovate, 3-lobed, the terminal lobe broad, retuse, the lateral ones ovate, blunt; the smaller, inner corolla-lobe ovate, entire, 3 mm long, 2.5 mm wide, blunt-acuminate. Stamens 2; filaments about 2 mm long; anthers 2-celled, one cell above the other, the lower cell spurred at the base, the spur rounded at its tip; pollen elliptic. Ovary glabrous, ovoid; style simple, 2.5 to 3 mm long. Fruit (immature) oblong, compressed, 3 mm long, 1.2 mm wide, hyaline, apiculate, containing four rounded, compressed, verrucose seeds.

LUZON, Province of Ilocos Norte, *Bur. Sci. 2312 Mearns,* February, 1907; Vintar, *For. Bur. 15509 Merritt & Darling;* Pasuquin, *For. Bur. 15536 Merritt & Darling,* November, 1908, in open grass-lands, etc., 100 to 400 m altitude.

Possibly most closely allied to *Justicia procumbens* Linn., which it resembles in habit, but is much more slender than any forms of that species known to me, differing in its very slender, continuous or interrupted spikes, five, instead of four sepals, its blue corolla, and many other characters.

STROBILANTHES Blume.

Strobilanthes mearnsii sp. nov.

Herba erecta, omnibus partibus plus minus hirsutis; foliis oblongo-lanceolatis, vel late ovato-lanceolatis, usque ad 15 cm longis, longe tenuiter acuminatis, denticulatis, in paribus inaequalibus; inflorescentiis laxis, paucifloris, pedunculis longis, hirsutis; floribus congestis, paucis; sepalis circiter 6 mm longis, anguste lanceolatis, hirsutis; corolla alba, usque ad 2.7 cm longa; staminibus 4; filamentis villosis.

An erect, branched herb, more or less villous or hirsute throughout, exceeding 60 cm in height. Branches terete, slender, dark-green or brownish, hirsute. Leaves opposite, in unequal pairs, oblong-lanceolate to broadly ovate-lanceolate, hirsute, membranaceous, the larger ones 8 to 15 cm long, 3 to 5 cm wide, the smaller ones of each pair half as large or smaller, acuminate at both ends, the apex slenderly so, dentate, the upper surface with numerous small rhaphides; nerves about 8 on each side of the midrib, distinct; petioles densely hirsute, 1 to 2 cm long. Inflorescence axillary, 7 to 10 cm long, few-flowered, hirsute, the flowers capitate at the ends of the few branches, 3 to 5 flowers in a head, the bracts foliaceous, deciduous. Calyx about 8 mm long, the lobes 6 mm long, narrowly lanceolate. Corolla white, about 2.7 cm long, the tube slender below, widened above, slightly hirsute outside, subequally 5-lobed. Stamens 4; filaments villous; anthers 1.3 mm long.

LUZON, Province of Benguet, Mount Tonglon, *Mearns s. n.*, December, 1906; Mount Ugo, *For. Bur. 15920 Bacani, Bur. Sci. 5727 Ramos,* December, 1908.

A species allied to *Strobilanthes pluriformis* Clarke, but distinguished from that and all other known Philippine forms in being strongly hirsute in all parts.

RUBIACEÆ.

COPTOSAPELTA Korth.

C. flavescens Korth. Ned. Kruid. Arch. 2 (1851) 113; Miq. Fl. Ind. Bat. 2 (1857) 155; Hook. f. Fl. Brit. Ind. 3 (1880) 35; King & Gamble in Journ. As. Soc. Beng. 72[2] (1903) 138.

Randia olaciformis Merr. in Philip. Journ. Sci. 3 (1908) Bot. 163.

Mindanao, Lake Lanao, Camp Keithley, *Mrs. Clemens 1220.*

Randia olaciformis Merr. must be reduced to *Coptosapelta flavescens* Korth., a species extending from Burma to the Malay Peninsula, Sumatra, Java, and Borneo, and the first representative of the genus to be found in the Philippines. Hooker f. gives *Webera macrophylla* Roxb. as a synonym of the above, which, if correctly reduced, would be the earliest specific name for the species. Roxburgh's description, however, does not seem to me to apply to *Coptosapelta flavescens* Korth.

DAMNACANTHUS Gaertn.

Damnacanthus indicus Gaertn. f. Fruct. 3 (1805) 18, *t. 182;* DC. Prodr. 4 (1830) 473; Hook. f. Fl. Brit. Ind. 3 (1880) 158; Forbes & Hemsl. in Journ. Linn. Soc. Bot. 23 (1888) 386.

LUZON, Province of Laguna, Mount Banajao, *For. Bur. 7856 Curran & Merritt,* November, 1907, *Bur. Sci. 2432 Foxworthy,* March, 1907, altitude 1,400–2,000 m.

The first representative of the genus for the Philippines, an interesting addition to the continental element in the Philippine flora; eastern Himalayan region to southern China and Japan.

GREENEA Wight & Arnott.

Greenea longiflora sp. nov.

Arbor parva, circiter 8 m alta, ramulis petiolis foliis cymisque hirsutis; foliis oblongo-ellipticis, papyraceis, 20 ad 30 cm longis, apice acutis vel obscure acuminatis, nervis utrinque circiter 15; cymis axillaribus, subscorpoideis, pauciramosis, usque ad 9 cm longis; floribus sessilibus, circiter 15 cm longis, 4-meris.

A small tree about 8 m high. Branches densely hirsute with long brownish hairs. Leaves papyraceous, oblong-elliptic, 20 to 30 cm long, 10 to 12 cm wide, very sligthly shining, the lower surface somewhat paler than the upper, both surfaces with numerous spreading or appressed scattered hairs, those on the lower surface softer and paler than those on the upper; nerves about 15 on each side of the midrib, distinct, the reticulations rather lax; petioles densely hirsute, 2 to 4 cm long; stipules membranaceous, caducous, oblong, about 4 cm long and 1.5 cm wide, rounded or obtuse at the apex, hirsute. Cymes axillary, peduncled, 9 cm long or less, hirsute, the branches few. Flowers sessile, arranged

along one side of the branches. Calyx-tube very short, the limb membranaceous, 1 mm long, obscurely 4-toothed. Corolla-tube about 15 mm long, cylindric, 3 mm in diameter, the outside with very few short appressed hairs; lobes 4, spreading or recurved, imbricate, broadly elliptic-ovate, acute or blunt, 4 to 4.5 mm long. Stamens 4, the filaments very short, inserted above the middle of the tube; anthers linear, 6 mm long, included. Style in the male flowers about 4 mm long, 4-cleft, obscurely pubescent.

MINDANAO, District of Zamboanga, Tibucuy, *For. Bur. 9430 Whitford & Hutchinson*, February, 1908, in forests at an altitude of about 20 m.

The first species of the genus to be reported from the Philippines, allied to *Greenea corymbosa* (Jack) K. Sch., of Burma and the Malay Peninsula, but abundantly distinct.

GREENIOPSIS gen. nov.

Calycis tubus turbinatus; limbi lobi 5, subaequales, breves, subrotundati, corolla breviter infundibularis, fauce villosa; limbi lobi 5, breves, rotundati, in alabastro sinistrorsum contorto-imbricati. Stamina 5, fauci corollae inserta, inclusa, filamentis brevibus; antherae dorso supra basin affixae, ellipticae. Ovarium 2-loculare; stylus gracilis, lobis stigmatis brevibus, crassis; ovula in loculis plurima, in placentis septo longitudinaliter adnatis conferta. Capsula oblonga vel ovoidea, 2-locularis, septicide 2-valvis, coriacea. Semina numerosissima, elongata praecipue in nucleo reticulato-areolata. Arbores. Folia opposita, chartacea vel subcoriacea, oblongo-obovata vel elliptico-obovata, petiolata. Stipulae amplae, deciduae, interpetiolares, acuminatae. Flores parvi. Inflorescentia terminalis, multiflora, cymis amplis, paniculatis, ramis ramulisque patulis.

This proposed new genus is allied to *Emmenopterys* of southern China and to *Mussaendiopsis* of the Malay Peninsula, Sumatra, and Borneo, but differs from both in none of its calyx lobes being accrescent, and from the latter also in its stamens inserted at the throat of the corolla-tube. It consists of two closely allied Philippine species, the following, the type of the genus, which has been previously referred to *Greenea*, species undetermined, and the plant described by Mr. Elmer as *Mussaendiopsis multiflora*.

Greeniopsis philippininensis sp. nov.

Arbor circiter 10 m alta; foliis oblongo-obovatis vel elliptico-obovatis, subchartaceis, nitidis, 20 ad 30 cm longis, apice breviter acuminatis, basi augustatis, decurrento-acuminatis, nervis utrinque 15 ad 18, prominentibus, glabris vel junioribus subtus minus hirsutis; paniculis terminalibus, amplis, ramis ramulisque patentibus, circiter 20 cm longis; floribus breviter pedicellatis, albis, 4 ad 5 mm longis; capsulis ellipsoideis vel ovoideis, 4 mm longis, extus griseo-pubescentibus, septicide 2-valvatis, apice limbo persistente coronatis.

A tree about 10 m high. Branches terete, reddish-brown, rugose, the younger branches reddish-brown, smooth, glabrous or sometimes hirsute.

Leaves opposite, oblong-obovate to elliptic-obovate, 20 to 30 cm long, 7 to 12 cm wide, shining, glabrous, or when young somewhat hirsute beneath, subchartaceous, the apex rather abruptly short-acuminate; nerves 15 to 18 on each side of the midrib, prominent on both surfaces, the reticulations subparallel; petioles 1.5 to 2 cm long, glabrous, or when young somewhat hirsute; stipules interpetiolar, oblong-lanceolate, brown, glabrous or sometimes hirsute, 1 to 3 cm long, deciduous, acuminate, sometimes cleft. Panicles terminal, grayish-appressed-pubescent, ample, the branches and branchlets spreading, many flowered, the flowers mostly on the upper half of the branches alternate, not or rarely secund. Flowers white, short-pedicelled. Calyx turbinate, the tube short, about 1 mm long and nearly 2 mm wide, appressed-gray-pubescent outside, the limb 1.5 mm long, with 5 broad, short, rounded teeth which are slightly ciliate on the margins, none of them accrescent. Corolla-tube about 3 mm long, somewhat widened above, the limb with 5 rounded lobes about 1 mm long, in bud somewhat overlapping to the left, the throat densely villous within below the anthers. Stamens 5, alternate with the corolla-lobes, the filaments short, inserted on the throat of the tube; anthers elliptic, attached at the back above the base, about 1 mm long, obtuse, longitudinally 2-celled, included. Ovary 2-celled; ovules indefinite, on the central placenta which is adnate to the disseptment; style 3 mm long, entire, crowned by the subcapitate or ellipsoid stigma which is about 1.2 mm long and somewhat cleft at the apex. Capsule coriaceous, appressed-gray-pubescent, ellipsoid or ovoid, about 4 mm long, 3 to 3.5 mm thick, crowned by the persistent calyx-limb, septicidal, 2-valved, 2-celled; seeds numerous, elongated, rather pointed at both ends, sometimes angular, 1 mm long, externally reticulate-areolate.

SAMAR, Borongan, *Merrill 5216* (type of the genus and species), October, 1906, in flower and fruit, growing along the border of a *Nipa* swamp; without definite locality, *Cuming 1713*, in fruit, in Herb. Kew. sub *Greenea*. LUZON, Province of Albay, Cabit, *Bur. Sci. 6402 Robinson*, August 31, 1908, near hot springs along the seashore, with flowers and fruits; Manito, *For. Bur. 10580 Curran*, June, 1908, along the seashore, in fruit.

In young specimens, such as the type, the branchlets, inflorescence, and the midrib and nerves on the under surface of the leaves are supplied with numerous long, brownish hairs, but these are deciduous, the mature specimens being glabrous or subglabrous with the exception of the more or less pubescent inflorescence.

Greeniopsis multiflora (Elmer) comb. nov.

Mussaendiopsis multiflora Elm. Leafl. Philip. Bot. 1 (1906) 14.

This differs from the above in having leaves with from 9 to 12 pairs of lateral nerves only, the fruits relatively longer and narrower (5 mm long, 2–2.5 mm thick), and which are secund on the ultimate branchlets of the infrutesence. In habit and general appearance it strongly resembles the preceding species, but can be distinguished by the above characters. The flowers are unknown.

DINAGAT, *Ahern 490*. (type) N. v., *Hamagos*.

LITOSANTHES Blume.

L. biflora Blume Cat. Gew. Buitenzorg (1823) 21; Bijdr. (1826) 994; Miq. Fl. Ind. Bat. 2 (1857) 314; DC. Prodr. 4 (1830) 465.

Luzon, Province of Sorsogon, Adlumay Hills, *For. Bur. 12383 Curran*, June, 1908. Mindoro, Mount Halcon, *Merrill 6172*, November, 1906; Mount Sablanga, *For. Bur. 11002 Merritt*, March, 1908; Mount Teluti, *For. Bur. 11478 Merritt*, May, 1908. Negros, *Elmer*.

The first representative of this small genus to be found in the Philippines; Java and Celebes.

Two species have been described from New Guinea.

NAUCLEA Linn.

Nauclea jagori sp. nov.

Arbor vel arbuscula glabra; foliis lanceolatis vel anguste lanceolatis, longe sensim acuminatis, 8 ad 20 cm longis, 9 ad 18 mm latis, basi angustatis, subcoriaceis, nitidis, nervis utrinque circiter 15; capitulis solitariis, circiter 3 cm diametro stylis exclusis; corolla glabra, 1 cm longa.

A shrub or tree, glabrous. Branches grayish-brown, terete, the branchlets somewhat compressed. Leaves lanceolate or narrowly lanceolate, 8 to 20 cm long, 9 to 18 mm wide, subcoriaceous, shining, brownish when dry, the base narrowed, acute, the apex long and gradually acuminate; nerves about 15 on each side of the midrib, not prominent, obscurely anastomosing, the reticulations indistinct; petioles 3 to 7 mm long; stipules oblong, obtuse, 12 to 15 mm long, 3 mm wide, slightly hirsute below, caducous. Heads solitary, the peduncles about 3 cm long, the bracts, if any, caducous, the heads, excluding the long exserted styles, about 3 cm in diameter. Corolla 1 cm long, glabrous, widened upward, the lobes oblong, obtuse, 2.5 mm long, 1 mm wide. Anthers 1.7 mm long. Style about 1.5 cm long; stigma about 2.5 mm long, swollen in the middle. Cocci 8 mm long; seeds, including the narrow, acuminate wings, 4 mm long, slightly pubescent.

Samar, *F. Jagor 987*, in Herb. Berol.

A very characteristic species, at once distinguished from most hitherto described ones in the genus by its very narrow leaves. It is apparently allied to *Nauclea angustifolia* Havil., of Borneo, and *N. chalmersii* F. Muell., of New Guinea, both of which have very narrow leaves, but the present species differs from these in its more numerously nerved leaves and larger flowers.

PLECTRONIA Linn.

Plectronia megacarpa sp. nov.

Arbor glabra circiter 15 m alta; foliis coriaceis, elliptico-ovatis vel obovato-ellipticis, circiter 20 cm longis, brunneis, nitidis, apice rotundatis vel late obscure acuminatis, basi cuneatis, nervis utrinque circiter 8, prominentibus, nervulis obscuris; fructibus axillaribus, pedicellatis, obovoideis, compressis vel trigonis, 2- vel 3-locellatis, 1.5 cm longis, apice truncatis vel retusis, basi acutis.

A glabrous tree about 15 m high. Branches brownish, terete or slightly compressed. Leaves coriaceous, elliptic-ovate or obovate-elliptic, about 20 cm long, 9 to 11 cm wide, the upper surface brown, shining, the lower paler, dull, margins somewhat recurved, apex broad, rounded, or broadly and obscurely blunt-acuminate, base cuneate, sometimes slightly acuminate; nerves about 8 on each side of the midrib, prominent, the nervules and reticulations obscure; petioles stout, 2 to 2.5 cm long; stipules deciduous, ovate, acuminate, less than 5 mm long. Flowers unknown. Infrutescence axillary, umbellate, the peduncle stout, about 5 mm long, the pedicels 1.5 to 3 cm long. Fruit yellow when fresh, 1.5 cm long, obovoid, trigonous and three-celled, or somewhat compressed and two-celled, nearly 1.5 cm thick above the middle, the apex truncate or retuse, the base acute.

LUZON, Province of Zambales, near Santa Cruz, altitude 100 m, *For. Bur. 8232 Curran & Merritt*, December, 1907.

A species apparently allied to *Plectronia glabra* (Blume) Kurz, but with different fruits and leaves.

TIMONIUS Rumph.

Timonius appendiculatus sp. nov.

Arbor parva, circiter 8 m alta, glabra; foliis coriaceis oblongis vel anguste elliptico-oblongis, usque ad 10 cm longis, basi plus minus decurrento-acuminatis, apice acutis vel obtusis, nervis lateralibus obscuris; cymis axillaribus, pauciramosis, foliis multo brevioribus; floribus 4-meris, unilateraliter spicatis, lobis corollae recurvatis, 3-appendiculatis; drupis globosis, obscure 12-sulcatis, polypyrenis.

A small tree glabrous throughout. Branches reddish-brown or grayish, terete, wrinkled when dry. Leaves coriaceous, oblong to narrowly elliptic-oblong, rather pale when dry, slightly shining, the apex acute or blunt, the base somewhat decurrent-acuminate, 6 to 10 cm long, 2 to 3 cm wide; lateral nerves few, obscure, and, with the reticulations, nearly obsolete; petioles less than 1 cm long; stipules annular, truncate, very short. Cymes in the upper axils, about 3 cm long, peduncled, with usually but two branches, the flowers spicately arranged on one side of the branches only, sessile, articulated with the rachis. Calyx cupular, about 3 mm long, 1.5 mm wide, truncate. Corolla about 9 mm long, tubular, the lobes 4, reflexed, narrowly ovate, acute, about 2 mm long, and with three retrorse appendages near the apex, the two lateral ones about 1 mm long, the terminal one shorter. Filaments short, inserted at the throat or just below it; anthers linear, nearly 5 mm long, their tips slightly exserted; style about 3 mm long. Fruit globose, shining, obscurely about 12-sulcate, crowned by the truncate calyx, about 5 mm in diameter, about 12-celled, and containing about 25 pyrenes.

LUZON, Province of Rizal, Bosoboso, *Bur. Sci. 2164, 2651 Ramos*, January, May, 1907, the former with staminate flowers, the latter with fruit. MINDORO, Mount Agong, *For. Bur. 9867 Merritt*.

A very characteristic species, differing from typical *Timonius* in its appendaged corolla-lobes, but in other characters typical, readily recognized by the above character, its few-branched cymes, 4-merous, sessile flowers in unilateral spikes, and its nearly nerveless leaves.

XANTHOPHYTUM Reinw.

Xanthophytum fruticulosum Reinw. ex Blume Bidjr. (1826) 839; Miq. Fl. Ind. Bat. 2 (1857) 175.

Metabolus ferrugineus DC. Prodr. 4 (1830) 436.

Sclerococcus Bartl. l. c., as syn.

Xanthophytum villarii Vidal Rev. Pl. Vasc. Filip. (1886) 150.

Lasianthus pilosus F.-Vill. Nov. App. (1880) 112, non Wight.

LUZON, without locality, *Haenke* in Herb. Prague, type of *Metabolus ferrugineus* DC.; Province of Rizal, San Mateo, *Vidal 392*, in Herb. Kew, type of *X. villarii* Vidal.

I have examined both of the above specimens, and can see no reason for distinguishing one from the other, or either from Reinwardt's species. Vidal's specimen has smaller leaves than Haenke's, but in all essential characters they appear to be the same, and after a cursory examination of Javan specimens and a careful comparison of the Philippine material with the descriptions of *X. fruticulosum* I do not hesitate to reduce both DeCandolle's and Vidal's species to Reinwardt's. Miquel l. c., had already reduced *Metabolus ferrugineus* to *Xanthophytum fruticulosum*, without however giving the range of the species as extending to the Philippines. An interesting species known only from Java, Borneo, and Luzon.

CAPRIFOLIACEÆ.

VIBURNUM Linn.

Viburnum floribundum sp. nov. § *Euviburnum, Opulus.*

Frutex circiter 2 m alta, subglabra vel parce pubescenti; foliis ovatis, usque ad 7 cm longis, chartaceis, nitidis, supra glabris, subtus in axillis barbatis, apice acutis vel acuminatis, basi inequilateraliter rotundatis, margine serrato-dentatis, nervis utrinque 5, prominentibus; cymis terminalibus, umbellato-paniculatis, dense multifloris; corolla rotata.

A shrub about 2 m high. Branches and branchlets terete, grayish- or reddish-brown, rather stout, glabrous, the branchlets minutely puberulent and with few scattered long hairs. Leaves ovate, 4 to 7 cm long, 2 to 4 cm wide, chartaceous, shining on both surfaces, the apex acute or acuminate, the base somewhat narrowed, rounded, inequilateral, the margins especially in the upper half, rather strongly serrate-dentate, the upper surface glabrous, or the midrib sometimes slightly puberulent, the lower surface glabrous except the midrib and primary nerves which are often slightly pubescent, and the axils of the primary nerves which are barbate; nerves 5 on each side of the midrib, ascending, very prominent, the reticulations distinct; petioles about 5 mm long, somewhat pubescent. Inflorescence terminal, paniculate-umbellate, intermixed frequently with small leaves, rather dense, 5 to 7 cm in diameter, very many flowered,

the rachis, branches and pedicels puberulent and with intermixed longer hairs. Flowers small. Calyx-lobes narrowly ovate, less than 0.5 mm long, pubescent. Corolla rotate, 1.8 mm long, the tube short, the lobes elliptic, rounded. Ovary depressed-globose, glabrous. Fruit ovate, compressed, 5 mm long, 4 mm wide, not ribbed, or with an obscure rib on one side.

LUZON, Province of Abra, Mount Paraga, *Bur. Sci. 7074 Ramos*, February, 1909, the altitude given as about 600 m.

A species manifestly allied to *Viburnum luzonicum* Rolfe, but distinguished from that species by its nearly glabrous leaves which are less acuminate, more strongly toothed, rounded and inequilateral at the base, as well as by its dense inflorescence.

Viburnum glaberrimum sp. nov. § *Euviburnum, Lantana* ?

Arbor parva, glabra, ramis ramulisque crassis, valde lenticellatis; foliis coriaceis, glabris, nitidis, obovatis, integris, apice rotundatis, obtusis, vel late obtuse acuminatis, basi obtusis vel leviter decurrenti-acuminatis, nervis utrinque 6 ad 8, prominentibus; inflorescentiis terminalibus, umbellato-corymbosis; corollae tubo cylindraceo, lobis erectis.

A small tree, glabrous throughout. Branches and branchlets stout, terete, dark-reddish-brown, strongly lenticellate. Leaves coriaceous, shining, obovate, entire, the apex broad, rounded, obtuse, or sometimes broadly and obtusely acuminate, the base obtuse or slightly decurrent-acuminate, 8 to 14 cm long, 6 to 8 cm wide; nerves 6 to 8 on each side of the midrib, very prominent beneath, the reticulations not distinct; petioles stout, 3 to 4 cm long. Inflorescence terminal, about 5 peduncles at the tip of each branch, forming an umbellate corymb, the peduncles 4 to 5 cm long. Calyx-tube short, the teeth very small, rounded, about 0.4 mm long. Corolla cyclindric, 5 mm long, thick, the tube 3 mm long, the erect, elliptic, obtuse lobes 2 mm long. Filaments about 5 mm long; anthers exserted, 2 mm in length. Ovary 1-celled. Fruit (immature) elliptic, compressed.

LUZON, Province of Pangasinan, near Imogen, *For. Bur. 15848 Merritt*, December, 1908, in forests 300 to 450 m altitude.

A species manifestly allied to *Viburnum coriaceum* Blume of the Indo-Malayan region, but at the same time very distinct, especially in its vegetative characters.

CUCURBITACEÆ.

GYNOSTEMMA Blume.

Gynostemma simplicifolia Blume Bijdr. (1825) 23; Cogn. in DC. Monog. Phan. 3 (1881) 915.

MINDANAO, District of Zamboanga, Sax River, *Williams 2119*, February, 1905.

New to the Philippines and the fourth species of the genus for the Archipelago; previously known only from Java.

TRICHOSANTHES Linn.

Trichosanthes villosa Blume Bijdr. (1826) 934; Cogn. in DC. Monog. Phan. 3 (1881) 366.

LUZON, Province of Rizal, Bosoboso, *Bur. Sci. 1027 Ramos*, July, 1906, with staminate flowers. MINDANAO, District of Davao, Todaya, *Copeland 1301*, April, 1904, with mature fruit.

Previously known only from Java.

MELOTHRIA Linn.

Melothria scaberrima sq. nov. § *Eumelothria.*

Planta monoica, floribus masculinis solitariis vel binis, breviter pedicellatis; foliis lanceolatis vel oblongo-lanceolatis, chartaceis, apice acuminatis, basi hastatis, margine integris vel leviter denticulatis, utrinque scaberrimis, subtus ad nervos hispido-aculeatis, usque ad 9 cm longis; fructibus ovoideis vel oblongo-ovoideis, glabris, basi acutis, apice acuminato-rostratis.

Monoecious. Branches slender, striate-sulcate, glabrous or nearly so. Leaves lanceolate or oblong-lanceolate, 4 to 9 cm long, 1 to 3.5 cm wide, chartaceous, the base hastate, truncate, the basal lobes short, spreading or slightly reflexed, the margins aculeate, entire, or in the lower part denticulate, gradually narrowed upward to the sharply acuminate apex, green or olivaceous when dry, of about the same color on both surfaces, the upper surface strongly white-glandular-scabrous, the midrib setose, the lower surface less scabrid than the upper, the midrib and nerves aculeate-hispid; basal nerves 5 to 7, the inner longer pair reaching at least to the middle of the leaf, ascending, anastomosing with the primary lateral nerves, the reticulations very lax, obscure; petioles 0.5 to 2 cm long, tendrils simple, leaf-opposed or from the axils below the leaves. Flowers white, solitary or two in an axil: staminate short-pedicelled, solitary or paired; calyx-lobes linear, 1 mm long; corolla lobes ovate, shorter; stamens 3, subsessile: pistillate flowers long-pedicelled; calyx teeth minute; corolla-lobes ovate, acuminate 3.5 mm long; stigma 2 mm in diameter. Fruit ovoid or oblong-ovoid, terete, glabrous, about 3 cm long, the base acute, the apex strongly acuminate-rostrate; seeds narrowly elliptic, compressed, 5 mm long, the base appendiculate-winged.

LUZON, Province of Benguet, *Elmer 5862; Williams 1055; Merrill 4657; Topping 83; Pond s. n.; For. Bur. 15979 Bacani.*

A species widely distributed in the pine region of Benguet Province, well characterized by its lanceolate, hastate, very scabrous leaves, and ovoid or oblong-ovoid rostrate fruits. Probably most closely allied to *Melothria zeylanica* Clarke, but very different from that species.

A PRELIMINARY REVISION OF PHILIPPINE MYRTACEÆ.

By C. B. Robinson.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

Although the Philippine species of this family are distributed over several genera, these as elsewhere in the Indo-Malay region have but few representatives, with the exception of *Eugenia.* That genus, as here interpreted, includes both *Jambosa* and *Syzygium,* besides *Eugenia* proper, so that the number of genera credited to the Archipelago is less by two than if the limits ascribed to it in the Pflanzenfamilien were here adopted. Moreover, while certain species in other genera have presented puzzling problems, the great bulk of the work has consisted in attempting to solve the questions relating to that genus. In it, alone of our larger genera, the collections made by Cuming, about 70 years ago, have never been worked up by European specialists, and only two supposed novelties were worked out by Vidal, one of these proving identical with a species of very wide distribution. In recent years, most of those found within the limits of the Lamao Forest Reserve were worked out by Merrill,[1] and several others of the more striking species have also been described by him. A smaller number has been described by Elmer. Apart from this genus, the family has been so accurately treated by preceding workers, that no additions have here been credited to the Philippines, although there are several cases of exclusion, due principally to the original incorrect localization of some of Cuming's collections. These also, will be found in previous articles on our flora by Merrill and Rolfe. Blanco's species were in all cases imperfectly characterized, though many of them can be identified with some degree of plausibility.

In the meantime, a large quantity of material has been accumulated, and recent additions have been considerable and often of great interest. Many of the species are of very considerable importance, primarily for their wood, although the larger timber-cutting firms utilize them, as yet, in but few localities, the best-known native wood yielded by a tree belonging to this family being Mancono, (*Xanthostemon verdugonianus*). The necessity for a revision of the family was evident, and while many

[1] *This Journal* 1 (1906) *Suppl.* 104–107.

of the species show a great range of variation, and others certainly distinct seem to be separated by comparatively trivial characters, it is hoped that such cases are here so grouped that the ultimate solution of their relationships will be facilitated.

From the following table intended to show the distribution of the species of this family in this and the nearer geographical divisions, it will be apparent at a glance that the genera found in the Philippines are for the most part typical in the Old World of the Indo-Malay region, the other extensions being chiefly Australian. Various genera, wrongly credited to the Philippines, are here excluded. In Australia, numerous other genera are found. The Formosan comparison is interesting, as a floristic classification, now much in favor, constitutes that island and the Philippines into a single sub-province.

Cultivated species have in all cases been excluded, with the exception of *Psidium* and two or three species of *Eugenia,* whose present distribution is such that it is difficult to pronounce an exact opinion on this point. *Psidium guajava* is now so widely spread in the Philippines, outside of cultivation, that it can not be excluded.

Genera.	China.[2]	Formosa.[3]	India.[4]	Malay peninsula.[5]	Java.[6]	Philippines.
Aphanomyrtus (Pseudoeugenia)	-------	-------	-------	2	1	-------
Baeckea	1	-------	1	1	-------	-------
Decaspermum	-------	1	1	1	2	2
Eugenia	14	3	131	96	62	98
Eucalyptus	-------	-------	-------	-------	-------	1
Leptospermum	-------	-------	2	1	1	1
Mearnsia	-------	-------	-------	-------	-------	1
Melaleuca	-------	-------	1	1	-------	-------
Osbornia	-------	-------	-------	-------	-------	1
Psidium	2	1	1	1	2	2
Rhodamnia	-------	-------	1	1	1	-------
Rhodomyrtus	1	1	1	1	-------	1
Tristania	-------	-------	5	5	-------	1
Xanthostemon	-------	-------	-------	-------	-------	1
Total	18	6	144	110	69	109

Among the undetermined material, one sheet, *For. Bur. 3880 Curran,* from Mount Pulgar, Palawan, may represent a genus as yet undescribed: it is in flower with merely strong probabilities as to the nature of the fruit, and the ovules are quite immature. It is possible that other

[2] Forbes & Hemsley, in Journ. Linn. Soc. Bot. **23** (1887) 295–298.
[3] Matsum. & Hayata in Journ. Coll. Sci. Tokyo **22** (1906) 142–144.
[4] Duthie in Hook. f. Fl. Br. Ind. **2** (1879) 462–506.
[5] King in Journ. As. Soc. Bengal **67**[2] (1898) 66–134.
[6] Koord. & Val. in Meded. 's Lands Plant. **40** (1900) 27–184.

species, as yet represented by sterile or incomplete material, may further add to the list of genera.

The material examined has consisted of the entire herbarium of this Bureau and occasional other sheets of recent collection. This has included practically all of Cuming's numbers in this family: two important collections practically unknown to me are those of Vidal and Loher, the former especially interesting as often indicating his ideas as to the identity of certain of Fernandez-Villar's determinations. These, it is understood, were made from probability and memory, rather than from direct comparisons.

A considerable number of specimens from other closely related regions are also in this herbarium, and direct comparison has often enabled the solution of questions that would otherwise have been held in abeyance. Most frequently the decision thus reached has been that the Philippine species has to be considered distinct: in several critical cases, I have not yet been able to make direct comparison with the species supposed to be most closely allied. I have to further gratefully to acknowledge assistance from W. W. Smith, Esq., of the Royal Botanic Garden, Calcutta, J. H. Maiden, Esq., of the Botanic Gardens, Sydney, Australia, and Doctors Treub and Valeton, Buitenzorg, Java.

KEY TO THE PHILIPPINE GENERA OF MYRTACEÆ.

Fruit a capsule.
  Petals separate.
    Leaves opposite ..... 2. *Mearnsia*
    Leaves alternate.
      Flowers axillary, solitary, or rarely in three's at the apex of short lateral branches ..... 6. *Leptospermum*
      Flowers in umbels or panicles.
        Stamens free ..... 3. *Xanthostemon*
        Stamens more or less united ..... 4. *Tristania*
  Petals united into an operculum ..... 5. *Eucalyptus*
Fruit indehiscent; leaves opposite.
  Corolla wanting ..... 1. *Osbornia*
  Corolla present.
    Ovary-cells 4 or 5 ..... 8. *Decaspermum*
    Ovary-cells 1 to 3.
      Leaves glabrous ..... 10. *Eugenia*
      Leaves pubescent.
        Under surface of leaves white-tomentose ..... 9. *Rhodomyrtus*
        Leaves not white-tomentose ..... 7. *Psidium*

1. OSBORNIA F. Muell.

Osbornia octodonta F. Muell. Fragm. 3 (1862) 31.

LUZON, Province of Tayabas, Laguimanoc, *Vidal 315;* Pitogo, *For. Bur. 10237 Curran:* Province of Camarines, Ragay, *For. Bur. 10416 Curran.* NEGROS, Prov. of Negros Occidental, Cadiz Nuevo, *For. Bur. 4219 Everett.* BASILAN, *Hallier s. n.:* PALAWAN, Malampaya Bay, *For. Bur. 4490, 7453 Curran.*

In the Philippines, it occurs as a shrub or small tree, attaining a height of 8 m, in mangrove swamps or along the beach. The only local names recorded are from Pitogo and Ragay, at both of which places it is known as *Tawalis;* at the former place it is used for posts, these lasting ten years or more.

Distribution: North Australia and Queensland; not yet reported from islands lying between there and the Philippines. Herbarium specimens are liable to be confused with those of *Lumnitzera racemosa* Willd.

2. **MEARNSIA** Merr.

Mearnsia halconensis Merr. in Philip. Journ. Sci. **2** (1907) Bot. 284.

MINDORO, Mount Halcon, *Merrill 5792.*

A monotypic endemic genus, those most closely allied being chiefly Australasian and Polynesian, but with outliers from New Guinea to Java (farther in cultivation), and in South Africa. Its affinities seem clearly to be with *Metrosideros,* shown beside the characters mentioned in the original description by the structure of the embryo. From that genus, it is distinguished by its tetramerous flowers and two-celled ovary.

3. **XANTHOSTEMON** F. Muell.

Xanthostemon verdugonionus Naves in Blanco Fl. Filip. ed. 3 (1877?) *pl. 300;* ex F.-Vill. Noviss. App. (1880) 82.

X. speciosus Merr. in Bur. Govt. Lab. Publ. (Philip.) **6** (1904) 10.

X. merrillii Pampanini in Nouv. Giorn. Bot. Ital. **12** (1905) 688.

CULION, Halsey Harbor, *Merrill 682.* TINAGO, *Ahern 428.* DINAGAT, *For. Bur. 7546, 12373 Hutchinson.* MINDANAO, Province of Surigao, Placer, *Long 44;* Surigao, *Bolster 279, Moore s. n.* LEYTE, Babatungon, *For. Bur. 12896 Rosenbluth.*

Known most usually throughout its range as *Mancono* or *Magcono,* or as *Palo de hierro,* rarely as *Kamulauan.* It is probably the tree called *Buñgan* on Busuanga. The wood is extremely hard, and commercially important.

Xanthostemon speciosus was distinguished from the typical form by its wider and much shorter calyx-tube; in later collections the line of separation breaks down, *For. Bur. 12373* having flowers which approach both extremes. It is not certain that all came from the same tree.

The genus is most widely developed in New Caledonia, extending into northern Australia, reported also from Celebes: the endemic Philippine species marking its farthest northern and western extension.

Endemic.

4. **TRISTANIA** R. Br.

Tristania decorticata Merr. in Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 51.

LUZON, Province of Cagayan, Caua Volcano, *R. N. Clark s. n.;* Missiones River, *For. Bur. 17184 Curran:* Province of Bataan, Mount Mariveles, *Whitford 1324, For. Bur. 6261 Curran:* Province of Rizal, Bosoboso, *Bur. Sci. 2682 Ramos:* Province of Tayabas, (Infanta), Tinuan River, *Whitford 787:* Province of Camarines, Lagonoy, *For. Bur. 10649, 10652 Curran;* Paracale, *For. Bur. 11523 Whitford.*

BORNEO, Sarawak, Mount Pöe (Rumput), *Foxworthy 378,* a shrub growing on the mountain top at an elevation of 1,700 m: otherwise not known except Philippine.

Most frequently known under the name of *Malabayabas,* also in Camarines as *Tiga,* and in Cagayan as *Adios* and *Baguitulay-bayaboj.* Known to the Dyaks as *Bindang.* Used for rice pestles, and for various other purposes.

Genus best developed in Australia and New Caledonia, but extending through the Malay Archipelago to the Malay Peninsula and Burma.

The flowers are white or yellow; the degree of pubescence of the inflorescence is variable.

5. **EUCALYPTUS** L'Herit.

Eucalyptus naudiniana F. Muell. Australas. Jour. Pharm. 1 (1886) 239; Maiden in Proc. U. S. Nat. Mus. 26 (1903) 691, 692.

Eucalyptus multiflora Rich ex A. Gray Bot. U. S. Expl. Exped. (1854) 554; non Poir. Suppl. 2 (1811) 594; Merr. in Philip. Jour. Sci. 3 (1908) 83, *pl. 2.*

MINDANAO, District of Zamboanga, Caldera, *U. S. Expl. Exped. (Wilkes) s. n.*

It has not as yet been possible to obtain additional Philippine material of this species, although it is believed to be still abundant near the locality where the Wilkes Expedition made its collections.

New Britain.

EUCALYPTUS TERETICORNIS Sm. Bot. New Holl. (1793) 41.

LUZON, Manila, *Philip. Normal School 329, 330 Aurelia Malvar.* Cultivated on the grounds of the Normal School. Both specimens were collected on the same day, from the same clump of trees, probably but not certainly from the same tree. Mr. J. H. Maiden, Director of the Botanic Gardens, Sydney, N. S. W., has very kindly confirmed the identifications, positively for *no. 329* (flowering), and probably for *no. 330* (fruiting). It is also grown elsewhere in Manila.

6. **LEPTOSPERMUM** Forst.

Leptospermum flavescens Smith in Trans. Linn. Soc. 3 (1797) 262.

L. amboinense Blume Bijdr. (1826) 1100.

L. annae Stein in Gartenfl. 34 (1885) 66.

LUZON, Province of Benguet, Mount Pulog, *For. Bur. 18051 Curran, Merritt & Zschokke:* Province of Isabela, Mount Bagabla, *For. Bur. 18569 Alvarez:* Province of Zambales, Mount Tapulao, *For. Bur. 8063a Curran & Merritt, Bur. Sci. 5082b Ramos:* Province of Bataan, Mount Mariveles, *Copeland 285, Whitford 123, Merrill 3246, For. Bur. 788, 2118 Borden, For. Bur. 6259 Curran, Bur. Sci. 1579 Foxworthy:* Province of Batangas, Mount Agas, *For. Bur. 7717 Curran & Merritt.* MINDORO, Mount Halcon, *Merrill 5746, 5747;* Mount Paloug, *For. Bur. 8526, 8739 Merritt;* Mount Burburungan, *For. Bur. 8523 Merritt.* MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4669 Mearns & Hutchinson;* District of Davao, Mount Apo, *Copeland 1081, s. n., DeVore & Hoover 312, 374.*

Even within our geographical limits, this is a most variable species, especially as concerns the numbers from Malindang and Pulog, which have wider leaves attaining 8.5 mm, definitely 3-nerved. Taken in its whole range, Tasmania to Malacca, the range of variation has been even more widely interpreted, and I find no sufficient warrant for segregating any of the Philippine material. It is uncertain what may be finally agreed upon as the specific name, as *L. porophyllum* Cav. Ic. 4 (1797) 17, *pl. 330, f. 2,* and *L. thea* Willd. Sp. Pl. 2 (1799) 949, based upon *Melaleuca thea* Wendl. Sert. Hannov. (1795–1798) 24, *pl. 13,* are both considered to be cospecific with *L. flavescens.*

As a mountain top tree or shrub this is not likely to receive local names, the only one recorded, by Borden, from Mariveles, being *Malasulasi.* No economic uses are noted, doubtless on account of its habitat.

The generic distribution range hardly exceeds that of this species, being from New Zealand to Burma.

7. **PSIDIUM** Linn.

Leaves 4.5–15 cm long..... 1. *P. guajava*
Leaves 2–3.5 cm long..... 2. *P. pumilum*

1. **Psidium guajava** Linn. Sp. Pl. (1753) 470.
P. pomiferum Linn. Sp. Pl. ed. 2 (1762) 672.
P. pyriferum Linn. Sp. Pl. ed. 2 (1762) 672.
P. aromaticum Blanco Fl. Filip. (1837) 417; nec Aubl. Pl. Guian. 1 (1775) 485, nec Descourt. Fl. Med. Antill. 5 (1827) 229.

A very early introduction from tropical America. Mercado, writing upon the medicinal plants of the Philippines, near the end of the seventeenth century, has a long article upon its uses, with no reference to its introduction or distribution in these Islands. Camel, at the very beginning of the eighteenth century, makes no reference to it in the text, but in the list of plants dealt with has "*Quaiabas*" placed with species belonging to *Eugenia*.

Blanco believed that it was undoubtedly indigenous, as stems and leaves which he positively identified with it, had been found in volcanic deposits of a period prior to the Spanish occupation. No such material is known to be preserved, and no direct opinion can be pronounced, but in view of the similarity of the leaves of several other species to those of the guava, and the general improbability of any other than an American origin, there is no sufficient reason to depart from the generally accepted opinion. It appears to be much more widely spread in the Philippines than elsewhere in the East, which may indicate that this was the first Asiatic country into which it was introduced, as might have been expected on the basis of American origin.

At present, it is not only cultivated, but extremely common in clearings and former clearings throughout the Islands. The localities represented in this herbarium are the Provinces of Cagayan, Isabela, Ilocos Sur, Union, Benguet, Bulacan, Bataan, Rizal, Laguna, Tayabas, Camarines, and Albay, in Luzon; Mindoro, Panay, Cebu, Negros, Palawan, and Basilan, and the Lanao and Davao districts of Mindanao. Both varieties are represented.

Known as *Guayabas* or *Bayabas*, sometimes as *Guava*. The fruit is used in many ways.

Cosmopolitan in the Tropics.

2. **Psidium pumilum** Vahl Symb. Bot. 2 (1791) 56.
LUZON, Province of Rizal, Bosoboso, *Bur. Sci. 1034 Ramos.*
Also introduced and known by the same names.

8. **DECASPERMUM** Forst.

Flowers solitary in the leaf-axils, rarely in 3's and then cymose..... 1. *D. blancoi*
Flowers in leafy panicles..... 2. *D. paniculatum*

1. **Decaspermum blancoi** Vidal Phan. Cuming. Philip. (1885) 172.
Myrtus communis Blanco Fl. Filip. (1837) 422: non Linn. Sp. Pl. (1753) 471.
Nelitris rubra Vidal Sinops. Atlas (1883) xxvi, *pl. 50, f. C:* non Blume Mus. Bot. Lugd.-Bat. 1 (1851) 73.
Decaspermum rubrum F.-Vill. Noviss. App. (1880) 84; non Baill. Hist. Pl. 6 (1877) 341.

LUZON, Province of Pangasinan, Balungao, *Merrill 2862:* Province of Principe, Baler, *Merrill 1091:* Province of Zambales, Bakilan, *For. Bur. 7002 Curran;* Subig, *Merrill 2097:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3890, For. Bur. 1331 Borden, For. Bur. 12401 Merritt & Curran:* Province of Tayabas, *Cuming 801:* Province of Albay, Batan Island, Calanaga, *Bur. Sci. 6282 Robinson.*

Local names, *Digotnalit*, (Il.), Pangasinan; *Ualisualisan*, (Tag.), Zambales.
A small tree or a shrub: fruit edible.
Endemic: altitudinal range from sea level to mountain tops.

2. **Decaspermum paniculatum** Kurz in Journ. As. Soc. Bengal **46**[2] (1877) 61.

Nelitris paniculata Lindl. Collect. Bot. (1821) 16.

N. urvillaei Benth. in Hook. Lond. Journ. Bot. **2** (1843) 220, quoad philippinensis; non DC. Prodr. **3** (1828) 231.

? Legnotis lanceolata Blanco Fl. Filip. (1837) 445.

? Metrosideros pictipetala Blanco Fl. Filip. ed. 2 (1845) 295.

BATANES ISLANDS, Sabtan Island, Savidog, *Bur. Sci. 3741 Fénix.* LUZON, Province of Benguet, Sablan, *Elmer 6188, Williams 1384;* Baguio, *For. Bur. 5074 Curran;* Mount Santo Tomas, *For. Bur. 927 Barnes, Elmer 5807;* Mount Pulog, *For. Bur. 18101 Curran, Merritt & Zschokke:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3861, Whitford 455, Elmer 6992, Leiberg 6041, For. Bur. 1332, 1589 Borden:* Province of Rizal, Bosoboso, *For. Bur. 3364 Ahern's collector, Bur. Sci. 1506 Ramos;* Antipolo, *Merrill Dec. Philip. For. Fl. 52 Ahern's colector, Bur. Sci. 3363 Ramos;* Tanay, *Merrill 2347:* Province of Laguna, Majaijai, *For. Bur. 8054 Curran & Merritt:* Province of Tayabas, *Cuming 821;* Tinuan River, *Whitford 804;* Lucban, *Elmer 7818;* Mount Banajao, *Whitford 984;* Polo Island, *For. Bur. 1415 Klemme.* LEYTE, Palo, *Elmer 7325.* BOHOL, *Cuming 1824.* PALAWAN, Puerto Princesa, *For. Bur. 3527 Curran.* DINAGAT, *Ahern 465, 475.* MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4580 Mearns & Hutchinson:* Lake Lanao, Camp Keithley, *Mrs. Clemens 557, 664, s. n.:* District of Cotabato, Malabang, *Mrs. Clemens s. n.:* District of Zamboanga, Port Banga, *For. Bur. 9068, 9476 Whitford & Hutchinson;* Sax River, *Williams 2107.* BASILAN, Hallier *s. n.*

Local names reported: *Salingsingang,* (Ig.), Benguet; *Tayomtayom,* (Tag.), Rizal; *Dugayon, Salilihan,* Dinagat; *Cansilay,* Zamboanga; *Malaruhat, Macaasin,* (Tag.), Tayabas, the two last more properly applied to species of *Eugenia.*

The identification of Blanco's species, called by different names in the two editions, is fairly probable, as all of his statements can be made to apply to dried specimens of *D. paniculatum*, except that relating to the color of the petals.

Distribution: Bengal to Formosa and Australia.

9. RHODOMYRTUS (DC.) Reichb.

Rhodomyrtus tomentosa Hassk. in Flora (1842) Beibl. **2**: 35; Benth. in Hook. Lond. Journ. Bot. **2** (1843) 220.

Myrtus tomentosa Ait. Hort. Kew. **2** (1789) 159.

BATANES ISLAND, Camiguin Island, *Bur. Sci. 4129 Fénix.* LUZON, Province of Ilocos Norte, *Cuming 1253.*

The transfer of Aiton's specific name to *Rhodomyrtus* has been ascribed to different authors, partly owing to the confusion due to the use of the name first as a subgenus, and finally as a genus. I have been unable to check the reference to Hasskarl.

Judged by description only, this is the nearest species yet known to *Eugenia glandulosa* Blanco Fl. Filip. (1837) 417, as indicated by the structure ascribed to the ovary of the latter, which suggests rather than agrees with that of the former. *Rhodomyrtus* seems to be confined in the Philippines to the extreme north, Blanco's plant grew at Malinta, within ten miles of Manila: nothing corresponding to it has appeared in recent collections, including those made on a trip to Malinta, in the hope of deciding the question.

India to Japan, southward to Malaya.

10. **EUGENIA** Linn.

This genus contains the great bulk of our Myrtaceous species, and for many reasons, requires introduction. From a purely systematic standpoint, it is perhaps desirable to state the reasons for including all our species under a single genus, though it is superfluous to one whose chief experience has been Asiatic or Australian. From the time of Linnaeus himself, many attempts at subdivision have been made, many of these bringing together numbers of closely allied species. The most recent, that of Niedenzu,[7] divides the group into the genera *Eugenia, Jambosa, and Syzygium,* in accordance with the previous arrangement by Bentham & Hooker as subgenera, under the same names, except that *Eueugenia* was used by them for the subgenus containing the more typical species. It is with *Jambosa* and *Syzygium* that we have here chiefly to deal, *Eugenia* proper being represented by only a few species.

Between a typical *Jambosa* and an equally typical *Syzygium*, the difference is great. The former has large flowers, the calyx-lobes are likewise large, the petals are free and fall separately, the disk is conspicuous, the filaments are long. The *Syzygium*, on the other hand, would have small flowers, with a calyx-margin truncate or inconspicuously lobed, the corolla would not be differentiated into petals but full as a single calyptra, the disk would be thin and the filaments short. Yet all these characters, except those drawn from the corolla, are, even superficially, matters of degree. Regarding the corolla, it may be added, that the calyptra, when fallen, is sometimes easily separable into distinct petals, sometimes not at all, and that in different flowers upon the same branch, some may have calyptrate corollas, while in others the petals may be free and outspread before falling. Experience with the Philippine species seeming to indicate that they can be best divided into natural groups by the presence of large and distinct calyx-lobes, as contrasted by their absence or small size, this character has been used as an early basis of division in the key. This being prefaced, it would seem at least as natural to separate generically such species as *E. operculata* and its very near Philippine ally, here described as *E. clausa*, where the apex of the calyx falls as a preliminary to the opening of the flower in a single piece, from the remainder, constituting practically the whole of the group, in which nothing of the kind takes place. No such proceeding has even been suggested, on the contrary these species are so close to others that confusion has sometimes taken place, and a similar error in this paper has only been prevented by field study.

It must be admitted that some of the Philippine species belonging to *Eueugenia*, are so superficially different from the rest of our species, that they seem at first sight generically distinct, but upon analysis the character upon which this difference is based proves to be pubescence and not the natural one of solitary or racemed flowers. Indeed, this section seems to shade into *Jambosa* at one extreme as perfectly as does *Syzygium* at the other. Further, within these sections, there are groups of species more definitely separable from the others of the section, than the sections are from one another.

For these and other reasons, the whole are here included within the one genus. One direction, along which it is proposed to make future investigations, is the nature of the seed. In *E. jambolana*, the cotyledons are thick and fleshy, occupying respectively the apex and the base of the cell, closely applied but easily separated, and then distinctly showing the radicle. In other species, the cotyledons occupy the sides instead of the extremities of the cell, or are not easily separable,

[7] Pflanzenfam. 3[7] (1893) 78–85.

often unequal, oblique or folded with the radicle included. Very few Philippine species are yet known in fruit, and such results as have been obtained do not warrant generalizations.

Many of the species have wide limits of variation, while others may seem to be separated by rather trivial characters. In the cases where a good series of specimens made it possible to form a definite opinion, the differences are often much greater than can be expressed in any key. Often the real basis of separation lies in the nature of the venation, and defies brief description, verbal or numerical. In doubtful cases, there is no way to obtain a satisfactory determination except by direct comparison with authentic material. Even then, it is often very difficult, as two series may be distinct but separated in such a way that it is conceivable that additional material might close the gaps.

In general the comparison of Philippine species with those of other countries has proved disappointing. Close alliances occur in the case of nearly all species, but only in a few do they seem close enough to warrant the inclusion of our plants with the limits of the outside species. A disproportionally high percentage of identical species falls within the limits of *Syzygium*.

The number of endemic species is consequently large, and a considerable proportion are here described as new. Several other species are represented in this herbarium by insufficient material to warrant description, and the most recent collections have added some of the most striking novelties. Even so, other species are known only from Cuming's collections, though these are now few. With several important regions of the islands not or very imperfectly worked, many additions are still to be expected.

Nearly all our Eugenias are trees, yielding hard, close-grained wood. They are widely used for construction and internal work, but only in a few places are they cut on a large scale. Yet, single species even, may form a measurable proportion of the forest of a given locality,[3] and one of the purposes of the present paper is to lay a basis for their separation and commercial classification. Naturally, the local names are badly tangled, the same species having several names in the same or different localities, while names like *Malaruhat* (*Mala-duhat*, false *Eugenia jambolana*), are applied to many species.

KEY TO THE PHILIPPINE SPECIES OF EUGENIA.[8]

1. Individual flowers subtended by one pair of bracteoles, these conspicuous or inconspicuous.
   2. Calyx-lobes conspicuous, petals free, flowers usually large.
      3. Inflorescence and flowers more or less villose or silky.
         4. Leaf-bases acute.
            5. Leaves at least 3.5 cm wide ..... 1. *E. aherniana*
            5. Leaves not attaining a width of 2.5 cm.
               6. Leaves at least 2.5 cm long.
                  7. Leaves membranaceous ..... 2. *E. loheri*
                  7. Leaves chartaceous or subcoriaceous ..... 3. *E. pasacaensis*

[3] See Merritt Bur. Philip. For. Bur. **8** (1909) 38 and elsewhere under Malaruhat.

[8] In this key and in the descriptions the calyx is understood as beginning at the articulation of the flower and that upon which it is borne. Very often, the lower part of the calyx is greatly contracted and seems to form a pedicel, but this pseudostalk is really a part of the flower, and often in whole or part conspicuously swollen in fruit. Frequently, flowers are here stated to be sessile, when apparently stalked. True pedicels are also present in a majority of species.

6. Leaves less than 2.5 cm long, coriaceous..... 4. *E. diplycosifolia*
4. Leaf-bases cordate ..... 9. *E. ramosii*
3. Younger parts with cinnamon-colored or reddish hairs or scales, retaining the color at maturity.
4. Leaf-apex obtuse, submarginal vein distinct..... 35. *E. cinnamomea*
4. Leaf-apex acute, submarginal vein interrupted..... 36. *E. williamsii*
3. Entire plant glabrous in all stages.
4. Flowers on the trunks or on the branches below the leaves, leaf-bases obtuse or cordate.
5. Primary lateral veins 30 or more.
6. Flowers in long branching cymes..... 13. *E. multinervia*
6. Flowers solitary on pendulous peduncles..... 8. *E. longissima*
5. Primary lateral veins 23 or less.
6. Leaves at least 30 cm long..... 11. *E. gigantifolia*
6. Leaves less than 30 cm long.
7. Inflorescence greatly condensed.
8. Veins except at base of leaf making nearly a right angle with midrib ..... 16. *E. angulata*
8. All veins strongly ascending.
9. Calyx-tube at least 1.5 cm in diameter.. 15. *E. phanerophlebia*
9. Calyx-tube about 7 mm in diameter..... 17. *E. leytensis*
7. Inflorescence not condensed.
8. Flowers solitary, rarely 2 in a fascicle.
9. Leaves chartaceous or membranaceous, barely or not cordate. 5. *E. bataanensis*
9. Leaves coriaceous, cordate ..... 6. *E. speciosissima*
8. Flowers not solitary.
9. Inflorescences from tubercles on the stem..... 12. *E. curranii*
9. Inflorescences not borne on tubercles.
10. Leaf-apex forming a slender acumen..... 23. *E. tripinnata*
10. Leaf-apex not forming a slender acumen.
11. Peduncles and usually pedicels very stout and woody. 31. *E. subrotundifolia*
11. Peduncles only moderately stout.
12. Calyx-tube 6 mm in diameter..... 32. *E. mindanaensis*
12. Calyx-tube at least 8 mm in diameter.
13. Calyx-lobes succulent in fruit..... 33. *E. javanica*
13. Calyx-lobes withering-persistent..... 34. *E. calubcob*
4. Flowers on the trunks or branches below the leaves, leaf-bases acute.
5. Primary lateral veins 25 or more..... 24. *E. rubropurpurea*
5. Veins rarely as many as 20, usually 12 or less.
6. Inflorescence, including flowers, less than 2 cm long.
7. Leaves nearly sessile..... 25. *E. rubrovenia*
7. Petioles 5–10 mm long..... 26. *E. conglobata*
6. Inflorescence at least 3 cm long.
7. Calyx-tube at least 2 cm in diameter..... 49. *E. megalantha*
7. Flowers smaller.
8. Branches of inflorescence stout.
9. Leaf-apices caudate-acuminate ..... 20. *E. fenicis*
9. Leaves not caudate.
10. Inflorescence somewhat congested, individual flowers very short pedicelled ..... 18. *E. malaccensis*
10. Flowers distant, distinctly pedicelled..... 19. *E. whitfordii*

8. Branches of inflorescence slender.
9. Inflorescences on trunk, many in each fascicle.
21. *E. mananquil*
9. Inflorescences not on trunk, solitary or paired.
10. Inflorescence widely branching, the many flowers sessile or very short-pedicelled..... 22. *E. luzonensis*
10. Inflorescences of 1–7 long-pedicelled flowers.
23. *E. tripinnata*

4. Flowers axillary or terminal, leaf-bases obtuse or cordate.
5. Inflorescences pendulous, solitary or paired, 1-flowered.
6. Leaves attaining 15 cm, lateral veins about 12.... 6. *E. speciosissima*
6. Leaves exceeding 30 cm long, lateral veins 25 or more.
8. *E. longissima*
5. Inflorescences not pendulous, at least 20 cm long, 1–3-flowered.
7. *E. longipedicellata*
5. Inflorescences not pendulous, 7 cm or less, lateral veins 40 or more.
10. *E. merrillii*
5. Inflorescences not pendulous, 1-flowered, not exceeding 8 cm, lateral veins about 12..... 5. *E. bataanensis*
5. Inflorescences not pendulous, more than 1-flowered, 12 cm or less, veins 25 or less, or if 1-flowered sessile or subsessile.
6. Inflorescence contracted, both peduncles and pedicels very short or wanting.
7. Submarginal vein definite.
8. Leaves lanceolate to elliptic, base cordate.
9. Calyx-tube at least 12 mm in diameter.
10. Primary veins coarse, secondary inconspicuous on upper surface ..... 16. *E. phanerophlebia*
10. Primary veins more slender, secondary evident on upper surface ..... 14. *E. copelandii*
9. Calyx-tube 6 mm in diameter..... 16. *E. angulata*
8. Leaves elliptic, base merely obtuse..... 30. *E. crassipes*
8. Leaves ovate to orbicular..... 31. *E. subrotundifolia*
7. Main submarginal vein interrupted..... 29. *E. subsessilis*
6. Inflorescence widely branching.
7. Calyx-lobes less than 1 mm long..... 28. *E. barnesii*
7. Calyx-lobes conspicuous.
8. Calyx-tube 6 mm or less in diameter..... 32. *E. mindanaensis*
8. Calyx-tube at least 8 mm in diameter.
9. Peduncles and usually pedicels stout..... 31. *E. subrotundifolia*
9. Peduncles and pedicels more slender.
10. Calyx-lobes succulent in fruit ..... 33. *E. javanica*
10. Calyx-lobes withering ..... 34. *E. calubcob*

4. Flowers axillary or terminal, leaf-bases acute; venation close, secondary veins as prominent as primary or nearly so..... 37. *E. longiflora*
4. Flowers axillary or terminal, leaf-bases acute, venation open; leaves in threes ..... 44. *E. triphylla*
4. Flowers axillary or terminal, leaf-bases acute, venation open, leaves opposite.
5. Calyx-tube at least 1 cm in diameter.
6. Flowers sessile, terminal ..... 45. *E. everettii*
6. Flowers pedicelled, terminal or axillary.

7. Primary venation coarse..... 48. *E. squamifera*
7. Veins not coarse.
8. Petioles not exceeding 2.5 mm, usually shorter.. 5. *E. bataanensis*
8. Petioles at least 5 mm long, usually longer.
9. Calyx-tube 2 cm in diameter..... 49. *E. megalantha*
9. Calyx-tube less than 1.5 cm..... 43. *E. xanthophylla*
5. Calyx-tube not exceeding 1 cm in diameter.
6. Inflorescence very short, flowers small.
7. Petioles 5–10 mm long..... 26. *E. conglobata*
7. Petioles not exceeding 3 mm.
8. Primary veins barely evident on upper surface.. 27. *E. subfoetida*
8. Venation more prominent ..... 25. *E. rubrovenia*
6. Inflorescence not very short.
7. Calyx-tube over 1 cm long, very slender..... 39. *E. leptogyna*
7. Calyx-tube over 1 cm long, not very slender.
8. Flower-buds ellipsoid ..... 40. *E. sulcistyla*
8. Flower-buds turbinate.
9. Calyx-lobes subequal, persistent..... 41. *E. jambos*
9. Calyx-lobes unequal, deciduous..... 42. *E. merrittiana*
7. Calyx-tube less than 1 cm long.
8. Individual flowers with definite pedicels.
9. Inflorescence repeatedly branched, many-flowered.
53. *E. candelabriformis*
9. Inflorescence few-flowered, peduncles slender.. 23. *E. tripinnata*
9. Inflorescence few to several-flowered, peduncles not slender.
10. Lateral veins slender..... 50. *E. robertii*
10. Lateral veins fairly strong.
11. Flowers racemosely arranged ..... 47. *E. brunnea*
11. Flowers paniculately arranged ..... 46. *E. vidaliana*
8. Flowers sessile or with very short pedicels.
9. Primary veins over 20, distinct..... 54. *E. hutchinsonii*
9. Primary veins under 16, secondary venation close, nearly as conspicuous as primary..... 59. *E. pulgarensis*
9. Primary veins under 16, secondary venation open.
10. Leaves membranaceous or submembranaceous
22. *E. luzonensis*
10. Leaves chartaceous or coriaceous.
11. Calyx-tube over 5 mm diameter, peduncles stout and woody.
12. Lateral veins about 12..... 51. *E. benguetensis*
12. Veins at least 15..... 55. *E. lacustris*
11. Calyx-tube less than 5 mm in diameter.
12. Inflorescence distinctly branched, leaf-apex not or barely acuminate ..... 38. *E. macgregorii*
12. Inflorescence branched, leaves acuminate.
13. Petioles about 1 cm long..... 46. *E. vidaliana*
13. Petioles less than 5 mm..... 52. *E. bordenii*
12. Flowers subcapitate on main axis of inflorescence or short lateral branches, leaves acuminate.
13. Leaves coriaceous ..... 57. *E. philippinensis*
13. Leaves chartaceous.
14. Leaves glandular ..... 58. *E. zamboangensis*
14. Leaves eglandular ..... 56. *E. palawanensis*

2. Calyx entirely closed in bud, opening transversely at anthesis, the apex falling, or simulating a lobe.
   3. Calyx 5 mm in diameter, flowers terminal..... 60. *E. arcuatinervia*
   3. Calyx 3 mm in diameter, flowers below leaves..... 61. *E. clausa*
2. Calyx-margin truncate, or with short lobes only, leaves obtuse or cordate at base.
   3. Corolla calyptrate.
      4. Leaves lanceolate to ovate..... 62. *E. glaucicalyx*
      4. Leaves widest near apex..... 63. *E. paucivenia*
   3. Corolla not calyptrate..... 28. *E. barnesii*
2. Calyx-margin truncate or with short lobes only, corolla more often calyptrate, leaves acute at base.
   3. Calyx-tube including pseudostalk at least 7.5 mm long.
      4. Leaves including petioles over 20 cm long..... 64. *E. subfalcata*
      4. Leaves less than 15 cm long.
         5. Calyx at least 9 mm long.
            6. Flowers mostly on the branches below the leaves.... 65. *E. claviflora*
            6. Flowers terminal or subterminal..... 66. *E. clementis*
         5. Calyx less than 9 mm long.
            7. Calyx-tube abruptly widened below the apex..... 67. *E. clavellata*
            7. Calyx-tube gradually widened from base to apex. 68. *E. rosenbluthii*
   3. Calyx-tube including pseudostalk less than 7.5 mm long.
      4. Flowers on branches below leaves, rarely also axillary.
         5. Secondary leaf-venation lax.
            6. Petals free, leaves widest toward apex ..... 69. *E. atropunctata*
            6. Corolla calyptrate, leaves widest toward base..... 70. *E. similis*
         5. Secondary leaf-venation close.
            6. Leaf-apices slenderly acuminate..... 71. *E. decipiens*
            6. Leaf-apices broadly or not acuminate..... 72. *E. jambolana*
      4. Flowers axillary or terminal.
         5. Bractlets at base of flowers and forks of inflorescence rigid, persistent, individual flowers nearly always pedicelled.
            6. Leaves oblanceolate to obovate.
               7. Calyx-tube 2–3 mm in diameter..... 74. *E. sablanensis*
               7. Calyx-tube 4.5–5 mm in diameter..... 73. *E. densinervia*
            6. Leaves orbicular or orbicular-obovate..... 75. *E. incrassata*
         5. Bractlets not persistent, more often inconspicuous.
            6. Inflorescence compact, except in fruit not exceeding 2.5 cm long.
               7. Primary veins crowded together.
                  8. Leaf-apices not or broadly acuminate..... 76. *E. congesta*
                  8. Leaf-apices slenderly acuminate ..... 77. *E. ugoensis*
               7. Primary venation more open.
                  8. Leaves not exceeding 3 cm long..... 78. *E. acrophila*
                  8. Leaves at least 4 cm long.
                     9. Lateral veins 10–12..... 79. *E. alvarezii*
                     9. Lateral veins about 20..... 80. *E. roseomarginata*
            6. Inflorescence not compact, lateral veins close, inter-reticulating, often obscure.
               7. Branches of inflorescence very slender.
                  8. Petioles at least 5 mm long, dried leaves pale or glaucous. 81. *E. perpallida*
                  8. Petioles not more than 3 mm long, dried leaves yellowish to reddish ..... 82. *E. parva*

7. Branches of inflorescence stout ..... 90. *E. robinsonii*
6. Inflorescence not compact, lateral veins not crowded, evident.
7. Flowers larger, calyx-tube exceeding 2.5 mm diameter.
8. Base of calyx narrowed into a pseudostalk.
9. Submarginal vein slender, often obscure..... 62. *E. glaucicalyx*
9. Submarginal vein definite.
10. Leaves chartaceous ..... 88. *E. mimica*
10. Leaves coriaceous ..... 89. *E. striatula*
8. Base of calyx not forming a pseudostalk.
9. Submarginal vein on extreme margin..... 90. *E. robinsonii*
9. Submarginal vein at least 1 mm from margin.
10. Submarginal vein often irregular but thick, all veins purple ..... 91. *E. brittoniana*
10. Submarginal vein slender, no veins purple. 92. *E. mindorensis*
7. Flowers small, calyx-tube not exceeding 2.5 mm in diameter.
8. Primary veins much more distinct than intervening ones.
9. Rachis and branches of inflorescence slender.
10. Calyx-tube abruptly contracted into a slender pseudostalk. 83. *E. saligna*
10. Calyx-tube gradually or not contracted into a pseudostalk. 84. *E. astronioides*
9. Rachis and branches of inflorescence rather stout.
10. Fruit 4-ribbed ..... 85. *E. costulata*
10. Fruit not ribbed..... 86. *E. benthamii*
8. Primary veins hardly more distinct than the secondary. 87. *E. grisea*

1. Individual flowers subtended by two decussate pairs of bracteoles.
2. Leaves obtuse or cordate at base, branchlets quadrangular.
3. Branchlets strongly 4-winged ..... 93. *E. garciae*
3. Branchlets only slightly or not winged.
4. Flowers on branches below leaves..... 94. *E. polycephaloides*
4. Flowers terminal or in upper axils.
5. Corolla calyptrate ..... 95. *E. oblanceolata*
5. Petals separate ..... 96. *E. intumescens*
2. Leaves acute at base.
3. Leaves oblanceolate, coriaceous..... 97. *E. curtiflora*
3. Leaves elliptic to obovate, chartaceous..... 98. *E. melliodora*

1. **Eugenia aherniana** sp. nov.

Floribus solitariis vel fasciculatis in foliorum axillibus, brevissime pedicellatis, pedicellis calycis tuboque pubescentibus, hoc late turbinato; calycis lobis inaequalibus, ciliatis; petalis 4, liberis, late ovatis, ciliatis; staminibus numerosis; fructibus subglobosis: foliis chartaceis vel subcoriaceis, ellipticis, ovalibus, orbicularibus, vel obovatis, basi acute acuminatis, apice obtuse acuminatis; venis utrinque 7–9.

Flowers solitary or few, fascicled on short tubercles borne in the axils of leaves, including the terminal and fallen, the pedicels very short and like the calyx-tube white-pubescent; the bracteoles inconspicuous, less than 1 mm long, ovate, obtuse, pubescent; calyx-tube broadly turbinate, 3 mm long, 5 mm in diameter at the base of the lobes; calyx-lobes 4,

unequal, 3.5–5 mm long, 5 mm wide, ciliate; petals 4, free, white, 6 mm long, 4–5 mm wide, rounded at the apex, ciliate; disk more or less pubescent, of the diameter of the calyx-tube; stamens numerous, the filaments 4–5 mm long, the anthers about 1 mm long; style 6 mm long; ovary 2-celled; fruit edible, subglobose, 2.5 cm in diameter, crowned by the persistent calyx-lobes, 1-celled, 1-seeded; the testa horny, the cotyledons lunate in outline, 13 mm across the chord.

A slender tree, sometimes tall, the branches covered with gray bark, the youngest shoots pubescent but soon becoming glabrous: leaves with petioles 3–7 mm long, the lamina chartaceous, elliptic to orbicular or obovate, 6.5–12 cm long, 3–5.5 cm wide, acutely acuminate at the base, the margins slightly revolute, the apex contracted into a short obtuse acumen, glands widely separated, not conspicuous except on young leaves; primary lateral veins on each side of the midrib, 7–9, their apices usually forming three submarginal veins, the intervening venation usually inconspicuous.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 619* (type): Province of Surigao, Surigao, *Ahern 518:* District of Zamboanga, Tetuan, *Ahern 561.*

Somewhat similar to *E. lucida* Lam., but with shorter pedicels, smaller flowers, and much less coriaceous leaves.

Local name, *Hangos*, Surigao; fruit edible.

2. **Eugenia loheri** sp. nov.

Floribus solitariis vel binis, axillaribus vel saepius supraaxillaribus, haud magnis, mediocriter pedicellatis, pedicellis floribusque pubescentibus: calycis tubo turbinato, lobis 4, quam tubus longioribus; petalis 4, liberis; staminibus numerosis; ovario 1- vel 2-loculari: foliis brevissime petiolatis, membranaceis, lanceolatis vel rarius subellipticis, basi acutis, apice in acumen obtusum productis.

Flowers most often borne a little above the axils, solitary or rarely paired, upon villose pedicels 5–10 mm long, having at their apices a pair of ovate bracteoles 1 mm long, subacute at the apex, white-villose especially along the central line and margins: calyx-tube turbinate, 2 mm long, 3 mm wide at the base of the lobes, villose; calyx-lobes 4, oblong, 3–4 mm long, 2 mm wide, the apex nearly truncate but rounded, the margins ciliate; petals 4, free, broadly oval to orbicular, 2.5–3 mm long; calyx-lobes and petals veined and bearing fairly numerous, conspicuous, tuberculate glands; disk occupying the whole diameter of the calyx-tube, pubescent; stamens numerous, the filaments 1.5–3 mm long, the anthers 0.4 mm long, the connectives more or less densely villose; style 3 mm long; ovary 1-celled or more often 2-celled, each cell containing several ovules.

Habit unknown: the bark covering the slender branchlets grayish-brown, tending to separate easily: leaves with petioles 1–2 mm long, the lamina membranaceous, densely glandular, lanceolate, narrowly lanceolate or rarely subelliptic, 2.5–5 cm long, 8–18 mm wide, the base acute, the

contracted apex forming, sometimes barely, an obtuse acumen attaining a length of 15 mm, the under surface of young leaves with a few hairs, soon glabrous; all veins very slender and with the exception of those of the youngest leaves difficult to count, usually only the three basal pairs conspicuous, the uppermost of these pairs forming the main submarginal vein, the more apical veins nearly obsolete, or other leaves showing traces of 3–5 others.

LUZON, Province of Pampanga, Mount Arayat, *Loher 2475* (type), distributed as *Decaspermum paniculatum:* Province of Nueva Ecija, *Cuming 1388*, an excellent match.

3. **Eugenia pasacaensis** sp. nov.

Frutex vel arbuscula: floribus axillaribus terminalibusque, saepius solitariis, mediocriter pedicellatis, bracteatis; calycis tubo turbinato; calycis lobis 4, oblongo-orbicularibus, mox patentibus vel reflexis; petalis 4, liberis; disco pubescente; staminibus numerosis: foliis subcoriaceis, lanceolatis vel elliptico-lanceolatis, basi acutis, apice obtuse acuminatis; venis utrinque 7 vel 8, teneris, marginem haud attingentibus.

Flowers white, fragrant, axillary or terminal, solitary or in fascicles of 2 or 3, the pedicels 5–12 mm long, their bases sometimes united for a short distance, puberulent; the 2 bracteoles at the base of the flower 1–1.2 mm long, oval, obtuse, shortly villose; calyx-tube turbinate or subcampanulate, 2 mm long, 3 mm in diameter at the base of the lobes, 1.3 mm in diameter at its base, puberulent; calyx-lobes 4, spreading or reflexed, persistent, oblong-orbicular, 2.7–3.3 mm long, and with the same range of width, though some are longer than wide and others wider than long, ciliate, the apices rounded; petals 4, free, broadly oblong, obtuse, 6 mm long, 3 mm wide; both calyx-lobes and petals veined, densely glandular; disk as broad as the calyx-tube, pubescent; stamens numerous, the filaments 3–4 mm long, minutely puberulent, anthers 0.5 mm long, the connectives glabrous; style 6 mm long; ovary 2-celled, several-ovuled.

A small tree or shrub 7 m high, with a stem 10 cm in diameter, the branches covered with gray or light-brown bark, the branchlets glandular and often pubescent, the vegetative parts otherwise glabrous; leaves with petioles 1–2 mm long, the lamina subcoriaceous, lanceolate or elliptic-lanceolate, 3–5 cm long, 14–22 mm wide, the base acute, the margin revolute, the apex forming an obtuse acumen 4–7 mm long, densely but not very conspicuously glandular on the under surface; primary lateral veins on each side of the midrib 7 or 8, often somewhat obscure, the second from the base forming a definite vein 1–2 mm from the margin.

LUZON, Province of Camarines, Pasacao, *For. Bur. 10467 Curran*, growing on limestone cliffs along the beach at an elevation of 100 m.

This species is so close to *E. bracteata* Roxb., that if my only knowledge of that species were obtained from its descriptions, it would be impossible to separate it. There is, however, in this herbarium, a Ceylon specimen of *E. bracteata*, *Thwaites 1586*, and it shows not only a difference in the color of the pubescence, and longer and narrower bracteoles, but the leaf-venation is very different, that of the Ceylon

plant most closely approaching among Philippine species that of the otherwise very different *E. mimica*, while the leaves (except in size) and the venation of *E. pasacaensis* are similar to those of *E. bordenii* and *E. robertii*, whose affinities are also very different. To those who have no Philippine material for comparison, it may suffice to call attention to the position of the submarginal vein.

4. **Eugenia diplycosifolia** sp. nov.

Floribus axillaribus vel terminalibus, solitariis vel duobus vel tribus in pedunculo sessilibus; pedunculis, bracteis, bracteolis, calycibus, et novellis incano-villosis: calycis tubo turbinato; calycis lobis 4, ovatis; petalis 4, liberis, omnibus conspicue glandulosis; staminibus paucis; foliis breviter petiolatis, coriaceis, ovalibus, obovatis, vel orbicularibus, basi acutis, apice breviter obtuseque acuminatis, venis utrinque 5–8.

Flowers terminal or in the upper axils, borne singly or in pairs or threes upon peduncles 7–11 mm long, the bracts at the base of the peduncle oval, 3.5 mm long, obtuse; when three flowers in a head, the two lateral with 3 bracteoles each, the anterior bracteole lanceolate, 2 mm long, the lateral ones shorter and narrower, the central flower ebracteolate, when flowers solitary or paired bracteoles as in lateral flowers of a triad; bracts, peduncles, bracteoles, and calyx white-villose and with the exception of the peduncles but including the petals densely pellucid-punctate: calyx-tube turbinate, 2.5 mm long, 2 mm in diameter at the base of the lobes; calyx-lobes 4, slightly less than 2 mm long, obtuse; petals 4, yellow, free, suborbicular with a basal claw, 3 mm long, 3-nerved with lateral branches, glabrous; disk of the diameter of the apex of the calyx-tube, glabrous; stamens 20–25, biseriate, the filaments 3–4 mm long, the anthers 0.3 mm long; style about 6 mm long; ovary 2-celled, or 3-celled, with several ovules.

A shrub 3 m high, its stems about 2 cm in diameter, the bark deciduous, that of the younger branches light-brown, densely covered with dark-brown glandular tubercles, the youngest shoots hoary-pubescent, vegetative parts otherwise glabrous, leaves with petioles 1–2.5 mm long, the lamina coriaceous, oval, obovate, or orbicular, 17–22 mm long, 10–15 mm wide, the base acutely acuminate, the margin revolute, the apex forming a very short and obtuse acumen, the under surface very densely covered with brown glands; primary lateral veins on each side of the midrib 5–8, but homologous veins irregular as regards meeting the submarginal vein or not, the submarginal vein definite from base, sometimes prolonged upon the petiole.

Luzon, Province of Bontoc, Talubin-Barlig trail, *For. Bur. 13403 Kleme*, in dense forest at an elevation of 1,600 m.

Closely allied to *E. mabaeoides* Wight, from which, however, it differs in several particulars. *Copeland 1186*, Mount Apo, Mindanao, and an unnumbered specimen collected by *H. N. Whitford* on Mount Silay, Negros, cospecific with one another, are very closely allied to *E. diplycosifolia*, but probably distinct. One specimen is in early fruit, the other sterile, and a final opinion can not be given until more material is obtained.

Local name, *Titimi*, Ig.

5. **Eugenia bataanensis** Merr. Philip. Journ. Sci. 1 Suppl. (1906) 104.

Jambosa bataanensis Merr. Bur. Govt. Lab. Publ. (Philip.) 17 (1904) 36.

LUZON, Province of Cagayan, Claveria, *Bur. Sci. 7367 Ramos:* Province of Pampanga, Mount Arayat, *Merrill 3932, 5014, For. Bur. 12308 Maule:* Province of Bulacan, *For. Bur. 7452 Curran:* Province of Bataan, Mount Mariveles, Lamao River, *Merrill 3761, Elmer 6807, Williams 729, For. Bur. 177 Barnes, For. Bur. 2083, 2386 Borden, For. Bur. 2407, 2765, Meyer:* Province of Rizal, Bosoboso, *For. Bur. 2686 Ahern's collector, Bur. Sci. 2078 Ramos:* Province of Tayabas, Mount Banajao, *For. Bur. 8042 Curran & Merritt.* MINDORO, Mount Calavite, *For. Bur. 8687, 8734 Merritt.*

The species is variable, passing from forms with broader bases, represented best by some of the Arayat collections, through those agreeing with the nomenclatorial type where the bases are narrow but still obtuse, to the Mindoro numbers where some leaves are acute and some obtuse, the extreme being reached in the Cagayan specimen, where the leaves are acute. In rough agreement, there is a decrease in thickness.

The only local names noted are *Calubcub* and *Malaruhat*, on Mariveles, both more properly applied to other species.

Endemic.

6. **Eugenia speciosissima** sp. nov.

Floribus solitariis, axillaribus, pedicellis circiter 2 cm longis suffultis, magnis, calycis tubo turbinato, lobis 4; petalis 4, late rotundatis, staminibus permultis: foliis coriaceis, lanceolatis vel elliptico-lanceolatis, basi cordatis subamplexicantibus, apice obtusis.

Flowers solitary, borne in the axils of the leaves or of fallen leaves, upon pendulous articulated pedicels about 2 cm long, subtended at the distinct articulation by two ovate bracteoles 0.5 mm long, often with additional bracteoles elsewhere on the pedicel: calyx-tube turbinate, the lower portion about 5 mm in diameter, at the base of the lobes 2–3 cm in diameter, calyx-lobes 4, unequal, the larger 2 cm wide, the apices broadly rounded; petals 4, rose-purple, broadly rounded, 2.5 cm wide at the base; staminal disk well developed; stamens very numerous, the filaments about 2 cm long, the anthers 2–3 cm long; style about 2.5 cm long.

A tree 6 m high, with a stem 15 cm in diameter, the branches and branchlets covered with grayish bark, the latter somewhat flattened or angled at the extreme apex: leaves borne on very short petioles, the lamina coriaceous, lanceolate or elliptic-lanceolate, 11–15 cm long, 3–6.5 cm wide, the bases cordate, gradually narrowed from below the middle to the obtuse apex, hardly or not acuminate; primary lateral veins on each side of the midrib 10–12, forming a conspicuous submarginal vein.

LUZON, Province of Benguet, Cayapa, *For. Bur. 10865 Curran* (type); Mosquito Creek, *For. Bur. 14193 Merritt;* growing at an elevation of 2,000 m.

Closely allied to *E. bataanensis* Merr., distinguished by its coriaceous leaves with much broader and more cordate bases often overlapping the branches, less acuminate apices, flowers larger and so far as seen always axillary and pendulous, while in *E. bataanensis* they are usually but not always terminal.

7. **Eugenia longipedicellata** (Merr.) comb. nov.
Jambosa longipedicellata Merr. Bur. Govt. Lab. Publ. (Philip.) 17 (1904) 37.
LUZON, Province of Principe, Baler, *Merrill 1046, 1047.*
Endemic.

8. **Eugenia longissima** Merr. Bur. Govt. Lab. Publ. (Philip.) 35 (1906) 50.
LUZON, Province of Benguet, Sablan, *Elmer 6218:* Province of Zambales, Mount Tapulao, *Bur. Sci. 5124 Ramos.*
Endemic.

9. **Eugenia ramosii** sp. nov.

Inflorescentiis terminalibus, composito-subumbellatis, multifloris: calyce petalisque extus sericeis; calycis tubo turbinato, lobis 4, rotundatis; petalis 4, liberis; staminibus numerosis: foliis brevissime petiolatis, chartaceis, anguste oblongis, oblanceolatis vel lanceolatis, longissimis, basi cordatis, apice acuminatis, venis utrinque 25–30.

Inflorescence terminal, including the flowers about 10 cm long, branching usually four times, the branches terete, at each articulation usually 5, the ultimate branches terete, 1–1.5 cm long, 1-flowered, bracteoles lanceolate, 1 mm long; the branches of the inflorescence and the outer surface of the calyx and petals silky-glandular; flowers described as yellow: calyx-tube turbinate, about 2 cm long and 1 cm in diameter at the base of the lobes, extending about 7 mm beyond the ovary, contracted into a pseudostalk below; calyx-lobes 4, unequal in pairs, 2.5–4 mm long, 7–8 mm wide at the base, rounded at the apex; petals 4, free, suborbicular, about 1 cm in diameter; stamens numerous, the filaments about 1 cm long, the oblong anthers nearly 1.5 mm long; style about 1.5 cm long; ovary 2–celled, several-ovuled.

A tree 10 m high, with a trunk 10 cm in diameter, the branchlets strongly 4-angled and winged, when dry with brownish or yellowish-brown bark: leaves with petioles about 5 mm long, the lamina chartaceous or subcoriaceous, narrowly oblong, lanceolate or oblanceolate, 30 to at least 55 cm long, 3–8 cm wide, the base cordate, the margin barely revolute, at the apex forming a narrowing acumen, probably 3–5 cm long, but the actual apex wanting on all leaves collected, upper surface pale-green, lower surface glaucous to brownish; primary lateral veins on each side of the midrib 25–30, forming three submarginal veins throughout the length except at the extremities, the innermost the thickest.

LUZON, Province of Isabela, San Luis, *Bur. Sci. 8030 Ramos,* growing in forests near the river at an elevation of 600 m.

10. **Eugenia merrillii** sp. nov.

Cymis terminalibus, multifloris, floribus mediocris, breviter vel non pedicellatis, tetrameris; foliis lanceolatis, basi cordatis, apice acutis falcatisque; venis utrinque 50–60.

Cymes terminal, widely branching, many-flowered, 4–7 cm long, the ultimate pedicels 5 mm long or wanting: calyx-tube 1.5 cm long, 6–7

mm in diameter at the base of the lobes, projecting about 6 mm beyond the ovary; calyx-lobes 4, unequal, widely rounded, 1–2 mm long, 4.5–6 mm wide; petals 4 or sometimes 5, 6–8 mm in diameter; staminal disk somewhat thick; stamens about 300, their filaments 6–10 mm long, their anthers oblong, 1 mm long, 0.6 mm wide; ovary 2-celled, with few ovules; style at least 1 cm long.

A tree 9 m high, with long drooping branches, its ultimate branches covered by purplish bark, together with the peduncles conspicuously 4-angled and 4-winged; leaves opposite, borne on petioles 5–6 mm long, the lamina coriaceous, olivaceous-brown and shining on the upper surface, purplish-brown beneath, narrowly oblong-lanceolate, 20–32 cm long, 3.5–6 cm wide, shallowly cordate at the base, gradually narrowed from a short distance above the base to the usually falcate apex; veins on each side of the midrib 50–60, not very close, intervening veins sometimes nearly as prominent as the primary, submarginal vein distinct, leaving a leaf-border 1–1.5 mm wide with inconspicuous veins only.

PALAWAN, Iwahig River, *Merrill 760*.

11. **Eugenia gigantifolia** Merrill sp. nov.

Floribus cymosis, pedicellatis, articulatis, caulinis, tetrameris; foliis subsessilibus, oblanceolatis, permagnis, basi leviter cordatis, apice rotundatis.

Flowers cymose, borne on small tubercles on the stem or older branches, 1–9 flowers in each fascicle, the pedicels 7–13 mm long, articulated with the flowers, when solitary themselves also articulated, terete or quadrangular, not or only slightly swollen at their apices, bracteoles paired, very short and inconspicuous but comparatively wide at their bases: calyx turbinate, in all 2.2–2.5 cm long, at anthesis about 1.3 cm in diameter at the apex of the tube, at the base more or less differentiated into a pseudostalk about 5 mm long, at the apex forming 4 unequal lobes, the larger pair 6–7.5 mm long, 11–12 mm wide, the smaller 4–5 mm long, 8–10 mm wide, all rounded at the apex; petals 4, orbicular but truncate at the base, 12 mm in diameter; staminal disk thick, conspicuous; stamens 400–500, the filaments 2–3 cm long, the anthers 1.5–1.8 mm long; ovary 2-celled, with numerous ovules; style slender, tapering, 1.8–2 cm long, in fruit attaining a length of 4.5 cm: fruit urceolate, 13 mm long, 17 mm wide, the calyx-tube forming a rim for about 4 mm, the calyx-lobes more or less persistent; 2-celled, its walls 1.5 mm in thickness, each cell containing one seed; seeds compressed, orbicular-ovate in outline, 1 cm in diameter, their testa probably brownish.

A tree 12–20 m high, with a trunk 20–40 cm in diameter, the leaf-bearing branches 3- or 4-angled, the bark yellowish to reddish-brown; leaves opposite or in whorls of 3 or 4, subsessile, the petioles only 1–2 mm long, but 6–9 mm width, becoming stout midribs projecting strongly from the under surface of the lamina; the lamina coriaceous, oblanceolate,

broadly oblanceolate, or rarely elliptic, 34–66 cm long, 9–21 cm wide, the smaller measurements probably representing young leaves, at the base broadly but very shallowly cordate, the least injured apices rounded, the dried lamina brown on both surfaces but paler on the under surface; primary lateral veins on each side of the midrib 16–23, conspicuous, usually with a few of the intervening veins nearly as prominent, cross veins distinct, the finer venation distinct on the under surface but not on the upper, a distinct submarginal vein present as well as a faint one very near the margin, the latter sometimes hidden by the slightly revolute margins.

CULION, Halsey Harbor, *Merrill 573* (type). MINDORO, Bongabon River, *For. Bur. 4110 Merritt;* Baruyan, *For. Bur. 5428 Merritt;* Mount Halcon, *For. Bur. 4359 Merritt.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 624.* BASILAN, *Hallier s. n.*

Local names, *Malatalisi* (Tag.), *Bagotalisi* (Vis.), Mindoro.

12. **Eugenia curranii** sp. nov.

Arbor, ramis 4-alatis: pedicellis longis, teneris, bracteolatis, floribus caulinis, paniculatis, tetrameris; foliis oblongo-ellipticis vel anguste ellipticis, apice acuminatis, basi cordatis, breviter petiolatis.

Flowers borne upon tubercles upon the stem, one to several panicles 6–8 cm long and 5–7-flowered from each tubercle, the peduncles and pedicels glandular, the pedicels 9 mm to 2 cm long, quadrangular, each having at its base a linear acute bract 2–4 mm long, and at its apex a pair of lanceolate or ovate bracteoles less than 1 mm long: calyx-tube broadly turbinate, about 1 cm long and 1 cm in diameter, or without the greatly narrowed pseudostalk hemispheric; calyx-lobes 4, ovate, the larger about 5 mm long and 7 mm wide, the smaller 3 mm long and 6 mm wide; petals 4, ovate, somewhat acuminate, rounded at the apex, 9 mm long, 7 mm wide; staminal disk thickened, stamens 350–400, the filaments 5–10 mm long, dilated at the base, the anthers 0.7 mm long, 0.6 mm wide; ovary 2-celled, each cell containing several minute ovules; style terete, 1.5 cm long.

A tree 16 m high, its trunk 20 cm in diameter, the ultimate branches distinctly 4-angled, and, especially near the apex, winged, more or less swollen at the nodes, covered with gray or brownish-gray bark: leaves with red annulate-rugose petioles 4–8 mm long and 1–3 mm in diameter, the lamina oblong-elliptic or narrowly elliptic, 15–29 cm long, 4.5–8 cm wide, more or less coriaceous, shallowly cordate at the base, at the apex forming an acumen about 1 cm long, olivaceous on the upper surface, brownish-green and glandular-punctate beneath; primary lateral veins on each side of the midrib 16–22, with a prominent vein 3–5 mm from the margin, these veins visible on both surfaces but better on the under where alone the fairly numerous transverse veins can be seen.

LUZON, Province of Camarines, Mount Isarog, *For. Bur. 10453 Curran.*

Fruit edible: wood used for boards.

13. **Eugenia multinervia** sp. nov.

Inflorescentiis caulifloris, cymosis, floribus mediocris, tetrameris; petalis liberis: foliis oblongo-ellipticis, magnis, basi cordatis, apice acuminatis; venis utrinque 32–35.

Inflorescences fascicled upon tubercles 1.5 cm long, situated upon the trunk, forming slender branching few-flowered cymes about 8 cm long, their branches and the calyces and less conspicuously the petals glandular; bracteoles at the base of the flower and at the forks of the inflorescence ovate, acute, 0.7–1 mm long; individual flowers, except sometimes one or more of the three terminal, with pedicels about 1 cm long: calyx-tube in all 13–15 mm long, 7–8 mm in diameter at the base of the lobes, the basal 7–8 mm greatly narrowed into a pseudostalk, the upper portion of the calyx hemispherical; calyx-lobes 4, 4–4.5 mm long, 7–8 mm wide at the base, the apex rounded; petals 4, free, orbicular or broadly ovate, 6–7 mm long, 7–8 mm wide, apex rounded; stamens numerous, the filaments 7 mm long, the ellipsoid anthers 0.9 mm long; style 6 mm long; ovary 2-celled, many-ovuled.

Habit unknown: the ultimate branches covered with yellowish-brown annulate bark, 4-angled: leaves with stout petioles 5–7 mm long, the lamina chartaceous, purplish on the upper surface, brown beneath, 27–31 cm long, 9–11 cm wide, the base distinctly but shallowly cordate, the apex contracted into a comparatively very slender short acumen; primary lateral veins on each side of the midrib 32–35, nearly straight, main submarginal vein about 4–6 mm from the margin, with a faint outer vein, midvein thick and on the under surface strongly projecting.

Luzon, Province of Cagayan, *Cuming 1299*.

14. **Eugenia copelandii** sp. nov.

Inflorescentiis axillaribus, brevissime pedicellatis et pedunculatis floribus admodum magnis, tetrameris, staminibus numerosis: foliis longis, lanceolatis, basi cordatis, apice vix acuminatis; venis utrinque 18–22, laminae facie utraque conspicuis.

Flowers borne in very condensed axillary one- to few-flowered cymes, the peduncles and pedicels not exceeding 2.5 mm, the entire inflorescence to the tip of the style 4.5 cm in length: calyx-tube turbinate, extending 6–7 mm beyond the ovary, at anthesis about 1 cm long, in early fruit 1.5 cm long, 2 cm wide at the base of the 4 rounded lobes, which are 3–6 mm long and 6–9 mm wide at the base; petals 4, about 8 mm long, 9 mm wide in the middle, somewhat abruptly contracted to a short broad claw at the base; stamens numerous, 2–3 cm long, the anthers about 1.5 mm long; style exceeding 3 cm in length.

Presumably a tree, the branchlets terete or slightly compressed near the apex, covered with gray or pale bark: leaves with petioles 2–3 mm long, the lamina submembranaceous, lanceolate, 20–32 cm long, 6–8 cm wide, slightly narrowed near the cordate base, gradually narrowed from below the middle to the barely acuminate nearly acute apex; primary

lateral veins on each side of the midrib 18–22, somewhat thin, and nearly the same color as the lamina, forming a definite submarginal vein, the secondary veins nearly as conspicous on the upper as on the under surface.

MINDANAO, District of Davao, Davao, *Copeland s. n.*

15. **Eugenia phanerophelebia** sp. nov.

Inflorescentiis terminalibus vel in axillis defoliatis, paucifloris; floribus magnis, tetrameris; calycis tubo turbinato, 4-lobato: arbor ramulis saepius tetragonis, foliis brevissime petiolatis, lanceolatis vel ellipticis, basi admodum angustatis, cordatis, apice acuminatis.

Inflorescence terminal or rarely on the branches below the leaves, 1–3-flowered, the peduncles none or attaining 1.5 mm, the pedicels sometimes articulate, and then attaining in all a length of 6 mm, bearing a pair of ovate bracteoles 0.5 mm long at each articulation: calyx-tube turbinate, about 2 cm long and about 1.5 cm in diameter at the base of the lobes, the later 4, rounded, unequal, 2–6 mm long, 5–7 mm wide; petals 4, broadly oval or orbicular, 8–10 mm long; stamens very numerous, the filaments 2–2.5 cm long, the anthers 1.5 mm long; style about 3 cm long; ovary 2-celled, with several ovules in each cell: only very young fruit known.

A small tree, its branchlets nearly always 4-angled and margined, covered with gray bark: leaves with petioles 1–5 mm long, the lamina chartaceous, lanceolate to elliptic, 14–25 cm long, 4–7 cm wide, the base cordate, the apex contracted to a slender obtuse acumen, the lower surface much paler than the upper; primary lateral veins very conspicuous on the under surface and often reddish, impressed on the upper surface, 15–18 on each side of the midrib, forming usually three submarginal veins, the outermost very faint, the middle one quite evident, the inner very conspicuous.

LUZON, Province of Rizal, Antipolo, *Bur. Sci. 3361 Ramos* (type); Tanay, *Merrill 2336:* Province of Tayabas, Atimonan, *For. Bur. 15265 Rosenbluth;* Guinayangan, *For. Bur. 12269 Rosenbluth.* MINDORO, Balete, *For. Bur. 6200 Merritt.*

From comparisons made at Kew, this species has been noted by Mr. Merrill as the *Eugenia coarctata* of Ceron's Catalogue, which seems to be the place where that species was first transferred from *Jambosa*, although the credit is there given to Blume. I have been quite unable to trace Blume's species in recent botanical literature, and *E. macrocarpa* Roxb., to which it is reduced in the Index Kewensis is not enumerated among the species of Java by Koorders and Valeton, even as a synonym, consequently it has been impossible to ascertain the limits of *E. coarctata*, and the present species has been described as new. It is certainly very closely allied to *E. macrocarpa*, comparison with Wight's figure indicating as apparent differences the much more acuminate apex, more condensed inflorescence and shorter bracteoles. Duthie[9] says that the figure shows the leaves too acute: if so, the most conspicuous distinction is removed.

Local name, *Malayambo,* (Tag.), Tayabas. When large, used as timber.

[9] Fl. Br. Ind. 2 (1878) 474.

16. **Eugenia angulata** sp. nov.

Inflorescentiis terminalibus, axillaribus, vel etiam foliis subtus suffultis, pedunculis pedicellisque brevissimis vel nullis: floribus parvis, calycis tubo turbinato vel fere obconico: foliis breviter petiolatis, lanceolatis vel anguste ellipticis, basi leviter cordatis, apice attenuatis acuminatis, venis utrinque 15–20.

Inflorescences terminal, axillary, and on the branches below the leaves, the peduncles wanting or attaining 4 mm in length, the pedicels entirely wanting or very short, rarely in all 1 cm long: calyx-tube ranging from obconic to nearly turbinate, extending 4–5 mm beyond the ovary, about 7 mm long, at the base of the lobes 6–7 mm in diameter, the 4 lobes unequal, 2–4 mm long, 3–6 mm wide at the base, all rounded at the apex; disk thickened; petals 4, 4–6 mm long; stamens probably numerous, the few seen with filaments only 4–6 mm long and anthers less than 0.5 mm long; style 12–15 mm long; ovary 2-celled, with several ovules.

A tree about 7.5 m high, its trunk 10 cm in diameter, covered with smooth pinkish-gray bark, the branchlets with gray bark, more or less angled and somewhat margined: leaves with petioles 2–3 mm long, the lamina chartaceous, lanceolate, elliptic-lanceolate, or narrowly elliptic, 16–24 cm long, 3–5 cm wide, the base slightly cordate, narrowed at the apex to a slender obtuse acumen; primary lateral veins on each side of the midrib 15–20, frequently with intermediate veins nearly as distinct, the secondary venation only loosely anastomosing, and on the upper surface inconspicuous, a very definite submarginal vein present.

MINDANAO, District of Zamboanga, Sax River, *Williams 2164* (type): Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.* The latter specimen is responsible for most of the variation in the inflorescence. The species is far from the one with most strongly angled stems even among Philippine Eugenias, but the name is used partly in default of a better available one, partly to call attention to its close alliance to *E. sexangulata* Miq., from which it is sufficiently distinguished by its inflorescence.

17. **Eugenia leytensis** Elmer Leafl. Philip. Bot. 1 (1908) 329.

Floribus caulinis, fasciculatis, subsessilibus, mediocris, tetrameris; foliis breviter petiolatis, subcoriaceis, oblanceolatis vel oblongis, basi obtusis, apice obtusis, haud acuminatis; venis utrinque 13–19, E. malaccensi affinis.

LEYTE, Palo, near Bangon River, *Elmer 7263*.
Endemic.

18. **Eugenia malaccensis** Linn. Sp. Pl. (1753) 470.
Caryophyllus malaccensis W. F. Wight in Contr. U. S. Nat. Herb. **9** (1905) 217, 314.

LUZON, Province of Tayabas, Gumaca, *Whitford 877:* Province of Albay, Tabaco, *Bur. Sci. 6520 Robinson.* MASBATE, Meygaran, *For. Bur. 999 Clark.* MINDORO, Bongabong River, *For. Bur. 4065 Merritt.* MINDANAO, Province of Surigao, *Bolster 295:* Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.:* District of Davao,

Davao, *Ahern 834;* Santa Cruz, *Williams 2871.* BALABAC, *Bur. Sci. 411 Mangubat.* NEGROS, Dumaguete, *Elmer 9852.*

Local names, *Macupa,* Davao; *Mangcopa,* Masbate; *Jamo,* Tayabas.

Widely cultivated in the tropics.

19. **Eugenia whitfordii** Merr. in Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 49.

LUZON, Province of Bataan, Mount Mariveles, *Whitford 468, For. Bur. 1182 Borden;* Limay, *Bur. Sci. 6169 Robinson.*

Local name, *Malaruhat.*

Endemic.

20. **Eugenia fenicis** sp. nov.

Floribus caulinis, cymosis, tetrameris, pedicellatis, articulatis, ovario 1–3-loculari; foliis ellipticis, basi acutis, apice caudatis.

Flowers borne on tubercles on the stem, these sometimes also bearing leafy shoots, cymose, 1–5-flowered, the total length of the fascicle including the styles attaining 8 cm, the ultimate pedicels 7.5–15 mm long, nearly terete and of equal diameter throughout, conspicuously articulated with the flowers and bearing at the point of articulation a pair of inconspicuous bracteoles: flowering specimens unknown: fruiting calyx in all 2.3 cm long, urceolate, 1.8 cm in diameter at the apex of the tube, which projects about 5 mm beyond the ovary, at the base forming a short pseudostalk 3 mm long and of slightly greater diameter; calyx-lobes 4, distant, unequal, the larger 7 mm long and 8–8.5 mm wide, the smaller 3.5 mm long, and 6 mm wide; the staminal disk thickened, stamens fallen, but judging from the scars probably about 300; ovary with exterior walls 1 mm in thickness, 1–3-celled, in the last case one cell as large as the other two together; seed from a 1-celled ovary oval in outline, compressed, 8 mm long, 6 mm wide; style 3–3.5 cm long.

A tree 8–9 m high, with a trunk 15 cm in diameter, covered with smooth reddish-gray bark, the ultimate branches with grayish or brownish bark, terete or at the apex somewhat angled; leaves borne on petioles 3–5 mm long and 2–2.5 mm in diameter, the lamina rather narrowly elliptic, 9.5–18 cm long, 2.8–5.5 cm wide, acute at the base, caudate-acuminate at the apex, olivaceous on the upper surface, grayish on the under surface; primary lateral veins 9–12, along with the submarginal vein conspicuous on both surfaces, but other venation hardly ever visible on either surface.

BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 4065 Fénix.* Close to *E. whitfordii,* as represented by *Bur. Sci. 6169,* which has much larger leaves than the earlier collections of that species; distinguished by its caudate leaf-apex and thickened petioles.

21. **Eugenia mananquil** Blanco Fl. Filip. ed. 2 (1845) 290.

Myrtus mananquil Blanco Fl. Filip. (1837) 421. (*M. manananquil* err. typ.)

Eugenia lobas Merr. in Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 48, prob. Blanco Fl. Filip. (1837) 857.

E. canliflora Blanco Fl. Filip. ed. 2 (1845) 291.

E. cauliflora Blanco Fl. Filip. ed. 3 (1878) 177, nec DC. Prodr. 3 (1828) 273, nec. Miq. in Linnaea 22 (1849) 537.

LUZON, Province of Ilocos Sur, Pinapinas, *For. Bur. 7121 Klemme:* Province of Zambales, Mataim, *For. Bur. 6333 Curran:* Province of Pangasinan, *For. Bur. 14382 Villamil:* Province of Pampanga, Mount Arayat, *Bolster 112:* Province of Batangas, Looc, *For. Bur. 7652 Curran & Merritt:* Province of Tayabas, Atimonan, *Merrill 3995;* Unisan, *For. Bur. 6548, 6601 Kobbe;* Guinayangan, *For. Bur. 837, 3232 Hagger:* Province of Camarines, Pasacao, *Ahern 187:* Province of Albay, Batan Island, *Bur. Sci. 6262 Robinson:* Province of Sorsogon, *For. Bur. 5753 Pray* LEYTE, Ormoc, *For. Bur. 12736 Rosenbluth.* MINDORO, Bongabong River, *Whitford 1385, For. Bur. 3658 Merritt;* Balete, *For. Bur. 6143 Merritt;* Buncuran, *For. Bur. 11428 Merritt.* MINDANAO, Province of Surigao, Agusan Valley, *For. Bur. 7163 Hutchinson:* District of Cotabato, Reina Regente, *For. Bur. 3928 Hutchinson;* Guitinludang, *For. Bur. 6561 Hutchinson:* District of Davao, Davao, *Copeland 504.*

Blanco's original description made no reference to the leaves, and their description in the second edition as lanceolate with very short petioles helps but little. For none of the most probable species is the amended description entirely satisfactory. Villar considered it to agree best with *E. javanica*, but there is reason to suppose that his interpretation of that species was only partly correct, and while this identification is not improbable, it is probably wrong. This species is certainly that considered by Merrill to be *E. lobas* Blanco. That species was said by Blanco to be cultivated and only doubtfully indigenous: it is possible that it was the same as *E. mananquil*, the latter wild, the former in cultivation, but the facts are beyond discovery. Possible identifications, both for *E. lobas* and *E. bauangica* Blanco are *E. malaccensis*. Blanco's *E. jambos* has been supposed to represent that species, but the probability is that it really was an error for *E. javanica*. The present species seems to be the one that best fits *E. mananquil*.

Wood hard, used in the construction of houses, especially for posts. Berry edible.

Local names: *Ansa,* Pangasinan: *Bagabug,* Pampanga; *Bitbid,* Camarines; *Buabua,* Mindoro; *Cagucug,* Cotabato; *Cajocko,* Leyte; *Dambuhala,* Batangas; *Jangus,* Surigao; *Kaguku,* Cotabato; *Malahaguis,* Sorsogon; *Malaruhat,* Zambales; *Midbid, Midbit,* Tayabas; *Mungilkil,* Mindoro; *Panglongbuyen-copaiopa,* Ilocos Sur.

It seems advisable to add a few additional data to the description given by Merrill *l. c.*

Flowers in cymes 3–12 cm long, many cymes usually borne on each cauline tubercle, the peduncles and pedicels slender, about 0.5 mm in diameter, the cymes 1–12-flowered, very rarely many-flowered and then with stouter peduncles, the flowers articulated, with a pair of small bracteoles at the point of articulation, flowers contracted into a pseudostalk 1.5–3 mm long.

A tree 7–20 m high, with opposite leaves borne on petioles 2.5–7 mm long, the lamina elliptic, 7–15 cm long, 2.5–5.5 cm wide; lateral veins on each side of the midrib 8–13.

Endemic.

22. **Eugenia luzonensis** Merr. Philip. Journ. Sci. 1 (1906) Suppl. 105.

Jambosa luzonensis Merr. Bur. Govt. Lab. Publ. (Philip.) 17 (1904) 37.

LUZON, Province of Benguet, Sablan, *Elmer 6229:* Province of Zambales, Subig, *For. Bur. 913 Maule:* Province of Bataan, Lamao River, *For. Bur. 83 Barnes, For. Bur. 619, 658, 1197, 1573 Borden, For. Bur. 6249, 7371 Curran, For. Bur.*

7373 Aguilar, Whitford 107, 357, Williams 644, Elmer 6881, Merrill Dec. Philip. For. Fl. 172 Borden: Province of Rizal, Bosoboso, *For. Bur. 3069, 3203 Ahern's collector, Bur. Sci. 2648 Ramos; Tanay, Merrill 2276.* NEGROS, Province of Negros Oriental, Tolon, *For. Bur. 12335 Everett.* MINDORO, Busuangay, *For. Bur. 9731 Merritt.*

Local names in Bataan, *Malaruhat, Malaruhat na pula,* or the equivalent *Red Malaruhat,* on one sheet *Macopa,* which is that given for Mindoro; in Rizal, *Ductulan;* in Zambales, *Lumboi bundoc;* in Negros, *Bumug.*

Endemic.

23. **Eugenia tripinnata** (Blanco) comb. nov.

Myrtus tripinnata Blanco Fl. Filip. (1837) 421.

M. subrubens Blanco Fl. Filip. ed. 2 (1845) 294.

Eugenia cymosa F.-Vill. Noviss. App. (1883) 85: non Lam. Encycl. 3 (1789) 199.

LUZON, Province of Rizal, Mount Santander, *Bur. Sci. 3288 Ramos;* Bosoboso, *For. Bur. 2675 Ahern's collector;* Antipolo, *For. Bur. 43½ Ahern's collector:* Province of Tayabas, between Bugulan and Pitogo, *For. Bur. 10216 Curran:* Province of Camarines, Calalinga, *For. Bur. 10720 Curran.* MINDANAO, Lake Lanao, *Mrs. Clemens 592.*

Flowers borne in terminal or less often lateral cymes, rarely upon the older branches, the individual cymes 3–5-flowered, 4–10 cm long, the peduncles and pedicels slender, the latter 7–32 mm long; pseudostalks at anthesis 5–6 mm long, calyx-tube about 3 mm long, turbinate, about 7.5 mm in diameter at the base of the 4 lobes, the lobes slightly unequal, semicircular, 2.5–3 mm long, 5–6 mm wide at the base; petals 4, suborbicular, 8 mm in diameter, rounded at the apex; staminal disk well developed; stamens numerous, the filaments exceeding 1 cm in length; the anthers 1.2 mm long; ovary 2-celled, each cell containing numerous small ovules, the ovarian wall just within the margin with a conspicuous row of oil-glands; fruit white to reddish, attaining a diameter of nearly 1.5 cm, the pseudostalk usually reduced to about 1 mm, the calyx-lobes persistent, conspicuous.

A tree 15–20 m high, with trunks about 25 cm in diameter, the ultimate branches covered with grayish or reddish bark; leaves borne on petioles 2–8 mm long, the lamina chartaceous, elliptic or oblanceolate, 8–13 cm long, 3–4.8 cm wide, acute or shallowly cordate at the base, at the apex acuminate, usually sharply, often conspicuously glandular-punctate; primary lateral veins on each side of the midrib 9–13, usually forming two definite submarginal veins.

The original description of *Myrtus tripinnata* contained many errors, as Blanco himself recognized before the publication of the second edition. In many ways the species suggested is *Eugenia luzonensis* Merrill, but one point seems to be conclusive as showing its difference from that species. The flowers are said to form a terminal umbel, whereas in *E. luzonensis* they are never entirely terminal, and only one collection has been found on which they are partially terminal. They are very widely paniculately disposed, the single flowers umbellate, sessile or subsessile, whereas those of the species here described as *E. tripinnata,* though not truly umbellate, might be roughly so characterized. They also are more often

terminal. The common name given by Blanco *Malaruhat na pula*, is often used for *E. luzonensis*, and it is by no means unlikely that he confused the two closely allied species.

The synonym *E. cymosa* is merely based upon Villar's identification with it of Blanco's species, to which it has no close alliance. *E. cymosa* Lam. has not been found in the Philippines.

Endemic.

24. **Eugenia rubropurpurea** sp. nov.

Inflorescentiis cymosis, caulifloris; floribus breviter pedicellatis, tetrameris, mediocris, rubropurpureis: foliis anguste ellipticis, basi acutis, apice breviter obtuseque acuminatis, venis utrinque 25–30.

Flowers borne on very short tubercles on the older parts of the branches below the leaves, the cymes fascicled, usually 3-flowered, either distinct as far as the tubercle or united with other cymes, the flowers articulated with the pedicels and the latter once or twice articulated, the ultimate pedicels 1.5–2 mm long, the entire fascicle not exceeding 3 cm in length, but of greater diameter: calyx nearly campanulate, 1–1.2 cm long, including a pseudostalk 2–3 mm long, the apex of the tube at anthesis about 7 mm in diameter, bearing 4 broadly ovate rounded lobes 3–4 mm long; petals 4, orbicular or orbicular-ovate, 7.5 mm long, 6.5–8 mm wide, rounded at the apex, usually with many veins and several large but not very conspicuous glands; staminal disk conspicuous; stamens nearly 200, their filaments 1.5–1.7 cm long, their anthers versatile, yellowish, lanceolate, 0.7–0.8 mm long: ovary inferior, 2-celled, or when young with 2 false partitions at the base, each cell containing several ovules; style 2.2 cm long or slightly longer in fruit, terete, slender.

A small tree about 5 mm high, its trunk 8 cm in diameter, the bark of the younger branches gray to grayish-brown, smooth or only slightly striate; leaves with petioles 1–2 cm long and 2–5 mm in diameter, often conspicuously annular-rugose when old, the lamina coriaceous, narrowly elliptic to elliptic, 25–33 cm long, 5.2–10.5 cm wide, acute and somewhat decurrent at the base, at the apex shortly and obtusely acuminate; primary lateral veins on each side of the midrib 25–30, with some of the intervening veins almost equally prominent, the anastomoses fairly numerous, forming a vein about 1.5 mm from the margin, and a less conspicuous vein about 0.5 mm from the margin, the lower surface minutely glandular-lepidote.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9386* (type), *9280, 9398, 9465 Whitford & Hutchinson.* BASILAN, Isabela, *For. Bur. 4830 Hutchinson.*

25. **Eugenia rubrovenia** sp. nov.

Inflorescentiis terminalibus, axillaribus, vel in ramis subtus foliis, brevibus, paucifloris; floribus parvis, sessilibus: calycis tubo turbinato, lobis 4; petalis liberis: foliis breviter petiolatis vel subsessilibus, chartaceis, ellipticis vel elliptico-oblanceolatis, basi acutis, apice acuminatis; venis utrinque 11–15.

Inflorescences terminal, or in the axils of present or fallen leaves, the peduncles not exceeding 1 cm in length or almost wanting, cymose, few-flowered, the individual flowers sessile, subtended by short bracteoles: calyx-tube 2–3 mm long, of which about the basal 1 mm forms a pseudo-stalk, 2.5–3.5 mm wide at the base of the lobes; calyx-lobes 4, somewhat unequal, 1.5–2 mm long, 2.5–3 mm wide, rounded; petals 4, suborbicular, about 2.5 mm in diameter; stamens numerous, the filaments 2 mm long, the anthers 0.3 mm long; style 4–5 mm long; ovary 2-celled, few-ovuled.

A small tree, its branches terete, the branchlets 4-angled, covered with gray bark: leaves with petioles not exceeding 3 mm long or subsessile, chartaceous, elliptic to elliptic-oblanceolate, 12–18 cm long, 4–7 cm wide, the base acute and decurrent, the apex rather abruptly contracted into a short acumen, brownish when dry, the under surface somewhat paler, glandular-dotted; primary lateral veins on each side of the midrib 11–15, immersed in the upper surface, projecting from the lower and distinct, purplish, forming a definite submarginal vein, or sometimes one or more of the most basal forming an outer vein; secondary reticulation evident but more often inconspicuous.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 973* (type), *s. n.*

26. Eugenia conglobata sp. nov.

Inflorescentiis axillaribus vel ramifloris, pedunculis pedicellisque brevissimis; calycis tubo turbinato vel subrotato, lobis 4, rotundatis; petalis liberis; disco evoluto; staminibus numerosis: foliis submembranaceis, ellipticis vel oblongo-lanceolatis, basi acutis, apice anguste acuminatis; venis utrinque 8–14.

Cymes greatly condensed, few- to several-flowered, axillary or on older branches, both peduncles and pedicels very short, never exceeding 3 mm: calyx-tube turbinate or subrotate, 4 mm long, 5–7 mm wide at the base of the lobes; calyx-lobes 4, 2.5–3 mm long, 3–3.5 mm wide, rounded at the apex; petals 4, free, orbicular-ovate, 3.5 mm long; disk well developed; stamens numerous, the filaments about 5 mm long, anthers suborbicular, about 0.2 mm in diameter; style nearly 1 cm long, ovary 2-celled.

A tree 12 m high, with a trunk 30 cm in diameter, the branchlets covered with cinnamon-colored striate bark: leaves with petioles 5–10 mm long, the lamina chartaceous, glandular-dotted, elliptic or oblong-lanceolate, 9–14 cm long, 3–6.5 cm wide, the base acuminately acute, the apex forming a slender but obtuse acumen 1–2 cm long; primary lateral veins on each side of the midrib 8–14, the basal 2–4 not conspicuously uniting with the more apical ones and therefore not aiding to form the submarginal vein.

MINDANAO, District of Zamboanga, Sax River, at 45 m elevation, *Williams 2359* (type). LUZON, Province of Camarines, Caramoan, San Roque, *For. Bur. 10677 Curran.* The latter collection has more numerously veined leaves than the type, but there seems to be no essential difference. *E. rubrivenia* is also very close, but differs by its paler bark, nearly sessile leaves, and sessile flowers.

27. **Eugenia subfoetida** sp. nov.

Inflorescentiis terminalibus vel lateralibus, brevibus, paucifloris: calycis tubo turbinato; lobis 4, rotundatis: foliis subcoriaceis, lanceolatis, basi acutis decurrentibusque, apice subcaudato-acuminatis; venis utrinque 10–12.

Cymes terminal or axillary, 1–3-flowered, only 1 cm long, excluding the style, peduncles present but not more than 2 mm long, individual flowers sessile or with very short pedicels, subtended by ovate bracteoles less than 1 mm long but comparatively conspicuous; calyx-tube turbinate, 3 mm long, 3.5–4 mm wide at the base of the lobes; calyx-lobes 4, rounded, 3–3.5 mm long, 3–5 mm wide; petals 4, free, orbicular-ovate, 4 mm long; disk present; stamens numerous, the filaments 6–8 mm long, the anthers suborbicular, only 0.2 mm in diameter; style 1 cm long; ovary 2-celled, its walls containing an unusually well-defined row of oil-glands.

A tree 10 m high, with a trunk 10 cm in diameter, its branchlets covered with gray or brownish bark: leaves with petioles 2–3 mm long, the lamina subcoriaceous, lanceolate, 9–13 cm long, 3–4 cm wide, the base acute and decurrent on the petiole almost to its insertion, the apex contracted into a very slender acumen; primary lateral veins on each side of the midrib 10–12, forming a very definite submarginal vein from base to apex, but none of the veins more than barely visible on the upper surface.

PALAWAN, Mount Victoria, at an elevation of 1050 m, *Bur. Sci. 685 Foxworthy.* Flowers white, with a slightly disagreeable odor.

28. **Eugenia barnesii** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 104.

Jambosa barnesii Merr. Bur. Govt. Lab. Publ. (Philip.) 17 (1904) 37.

LUZON, Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 140 Barnes, For. Bur. 733, 1198, 1236 Borden, For. Bur. 2774 Meyer, Whitford 251.*

In spite of the small size of the calyx-lobes, which are usually only 7–8 mm long, they are broadly rounded, and in all other respects the plant is a typical *Jambosa*, and clearly allied to the species with which it is here placed. The petals are entirely separate, but early deciduous.

Allied to *E. paucipunctata* Koord. & Val., from which it is easily distinguished by its much fewer and larger flowers.

Endemic.

Local names, *Malacolubcob, Malacolubcub, Putyan.*

29. **Eugenia subsessilis** sp. nov.

Inflorescentiis terminalibus, brevissime pedunculatis et pedicellatis, floribus mediocris, tetrameris: foliis breviter petiolatis, lanceolatis, oblongo-lanceolatis vel elliptico-lanceolatis, basi cordatis vel obtusis, apice acuminatis; venis utrinque 10–12, vena submarginali interrupta.

Inflorescence terminal, 3–5-flowered, the peduncles and peduncles 1–2 mm long; calyx-tube glandular, turbinate, 1.5 cm long and of about equal diameter at the base of the lobes, projecting nearly 1 cm beyond the ovary, calyx-lobes 4, unequal, rounded, 3–4 mm long, 5–8 mm wide

at the base; petals and stamens unknown; staminal disk well developed; style slender, attaining a length of 4 cm; ovary containing 2 cells each with several ovules: fruit 2 cm in diameter, globose not including the persistent free portion of the calyx-tube or the more or less deciduous lobes, 2-celled with one seed in each.

A tree 6–9 m high, its trunk 10–12.5 cm in diameter, covered with pinkish-gray bark, the ultimate branchlets terete, somewhat flattened at the enlarged nodes, the ultimate ones sometimes slightly angled, covered with bark varying in color from gray to brown; leaves borne on petioles 1–4 mm long, the lamina chartaceous, lanceolate, oblong-lanceolate, or elliptic-lanceolate, 10–20 cm long, 3–7 cm wide, the base cordate or merely obtuse, the apex acuminate, straight or subfalcate; primary lateral veins on each side of the midrib 10–12, curved-ascending, at least some, usually about 5, of the basal veins connected with the main submarginal vein by slight anastomoses only but contributing to form one or more inconspicuous veins lying without the main submarginal vein but not prolonged to the apex.

MINDANAO, District of Davao, Santa Cruz, *Williams 2748* (type): District of Zamboanga, San Ramon, *Hallier s. n.;* Saccal Island, *For. Bur. 6113 Hutchinson.*

Wood utilized as material in house-building on Basilan, where it is known as *Tambistambis* or *Gulagan.*

30. **Eugenia crassipes** sp. nov.

Jambosa vulgaris Merr. in For. Bur. Bull. (Philip.) 1 (1903) 43, non DC. Prodr. 3 (1828) 286.

Eugenia javanica ? Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 105, non Lam. Encycl. 3 (1789) 200.

Local name, *Calubcob*, Bataan.

Inflorescentiis terminalibus, pedunculis pedicellisque crassis, congestis vel subcongestis, floribus admodum magnis, tetrameris: foliis ellipticis vel lanceolatis, basi obtusis, haud cordatis, rarius subacutis; venis utrinque 10–12.

Cymes terminal, the peduncles and pedicels stout, in all less than 2 cm long to the base of the terminal flower, 5-flowered, the pedicels 4–8 mm long: calyx-tube turbinate, in length 1 cm or slightly more to the base of the lobes and there 10–13 mm in diameter; calyx-lobes 4, 3–5 mm long, 5–8 mm wide, broadly rounded; petals 4, white, suborbicular, 8 mm in diameter; disk well developed; stamens very numerous, the filaments about 1.5 cm and the narrow anthers about 1.5 mm long; style 3.5 cm long; ovary 2-celled.

The type described as a small tree 3 m high with a trunk 3 cm in diameter, the branchlets terete or flattened toward the apex covered with gray or yellowish-gray bark: leaves with petioles 2–3 mm long, the lamina chartaceous, elliptic or lanceolate, 16 to at least 20 cm long, 6–9 cm wide, the base not cordate, obtuse or subacute; primary lateral veins on each

side of the midrib 10–12, arching and forming a definite submarginal vein except sometimes near the base, veins of lower orders loosely anastomosing, distinct on both surfaces but hardly conspicuous.

LUZON, Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 193 Barnes* (type), *Ahern 751.* With these may possibly belong *For. Bur. 4281 Klemme*, collected at San Vicente, Province of Cagayan, Luzon, with similar inflorescence, but the flowers more attenuate below, longer petioles, but smaller leaves.

31. **Eugenia subrotundifolia** sp. nov.

Floribus permagnis, cymoso-paniculatis: calycis tubo turbinato, lobis 4; disco stamineo conspicuo; staminibus numerosissimis; ovario 2-cellulari: foliis coriaceis, ovalibus, late ovatis, late obovatis, vel subrotundis, basi rotundatis, apice breviter acuminatis.

Flowers terminal on thickened usually short lateral or terminal branchlets, the inflorescence 1–9-flowered, cymose-paniculate, the ultimate pedicels stout, 3–15 mm long, or in terminal flowers sometimes wanting, the bracts and bracteoles lanceolate, acute, 2.5–3 mm long: calyx-tube turbinate, 2 cm in diameter at the base of the lobes; the lobes 4, unequal, semiorbicular, 8 mm long, 8–12 mm wide; staminal disk conspicuous; stamens very numerous, the filaments 2–2.5 cm long, dilated at the base, the anthers oblong-lanceolate, 1.5 mm long; style 3–4 cm long, thickened near the base and there 1.5 mm wide; ovary 2-celled, the cells containing each several ovules, or all except one aborting, the walls thick, containing a row of glands; ovules about 2 mm long.

A tree attaining a height of 15 m and a trunk-diameter of 50 cm, the bark of the branches grayish or brownish, that of the flowering branchlets yellow, brown, or purplish: leaves with stout usually purplish petioles 2–3 mm long, the lamina coriaceous, oval, broadly ovate, broadly obovate, or nearly round, 8–15 cm long, 6–11.5 cm wide, the base rounded or truncate or at the extreme base often acute, the apex very shortly acuminate; primary lateral veins on each side of the midrib 7–10, arched, forming a very definite submarginal vein and a fainter but equally definite one still nearer the margin, one or both surfaces at least when dry often brownish or purplish.

BATANES Islands, Batan Island, Santo Domingo de Basco, *Bur. Sci. 3594 Fénix* (type), *Bur. Sci. 3203 Mearns;* Fuga Island, *Bur. Sci. 3237 Mearns.* LUZON, Province of Cagayan, Abulug, *For. Bur. 17109 Curran:* Province of Ilocos Norte, *Cuming 1251:* Province of Tayabas, between Paete (Laguna) and Piapi, *For. Bur. 10121 Curran;* Tinuan River, *Whitford 756;* Mauban, *For. Bur. 10185 Curran;* Atimonan, *Whitford 704:* Province of Sorsogon, Sugod Bay, *For. Bur. 5164 Bridges.*

Compared with the type of *E. amplexicaulis* Roxb. to which it is allied, by W. W. Smith Esq., of the Royal Botanic Garden, Calcutta, who finds that it differs from that species by its stouter pedicels, flowers half as large again, and comparatively much broader leaves.

Local names, *Bayacbac,* Batan Island; *Baracbac,* Cagayan; *Malaambu,* Tinuan River; *Barangan,* Sorsogon.

32. **Eugenia mindanaensis** sp. nov.

Inflorescentiis terminalibus, axillaribus, vel rarius in axillis defoliatis, gracilibus, saepius trifloris; floribus mediocris, 3, terminalibus sessilibus, vel etiam singulis in ramulis lateralibus suffultis, tetrameris, calycis tubi superiore parte campanulata subtus valde angustata; foliis chartaceis, subsessilibus, oblanceolatis vel ellipticis, basi cordatis, apice acuminatis, venis utrinque 12–14.

Individual inflorescences solitary or paired, 3–5.5 cm long, terminal, axillary, or sometimes in the axils of fallen leaves, most often containing 2–4 greenish-white sessile flowers at the apex of a slender articulated peduncle, or with an additional flower on one or both sides below the apex, these latter borne on pedicels which increase in length according to the distance from the apex: upper portion of the calyx-tube campanulate, rather abruptly contracted into a narrow pseudostalk, the latter about 6 mm long, the upper portion of the tube 4 mm long and 6 mm wide at the base of the lobes, its apex extending about 4 mm beyond the ovary, lobes 4, rounded, unequal, though not conspicuously, 2–3.5 mm long, 4–5 mm wide, the margins similar to the petals; petals 4, 6–7 mm long, their margins involute, if spread about 5 mm wide, at the base contracted into a claw 1 mm wide and at least as long; staminal disk well developed; stamens numerous, the filaments 7–10 mm long, anthers 0.6–0.7 mm long; ovary 2-celled, near the apex of the tube, style 12–15 mm long, stigma capitate, small but fairly conspicuous for the genus.

A tree 6 m high, its trunk 10 cm in diameter, the branchlets terete or somewhat compressed at the apices, covered with grayish to brownish bark; leaves with petioles not exceeding 2 mm or almost wanting, the chartaceous lamina oblanceolate to elliptic, often somewhat oblique, 7–17 cm long, 3–8 cm wide, the base cordate, often more or less overlapping the stem, the apices forming an obtuse acumen; primary lateral veins on each side of the midrib 12–14, rather slender but forming a very definite submarginal vein, another less conspicuous intervening between it and the margin.

MINDANAO, District of Davao, Santa Cruz, *Williams 2752* (type), *2801:* Lake Lanao, Camp Keithley, *Mrs. Clemens 477*. DINAGAT, *Ahern 479*. BASILAN, *DeVore & Hoover 71*.

Williams 2801 seems certainly to belong with the other collections here cited, but is remarkable for having the calyx developed into a berry about 1 cm in diameter, bearing upon its apex not only the unchanged calyx-lobes, but the stamens and style. Both this collection and that of Mrs. Clemens record the fruit as edible, the former noting that it rarely contains seeds.

Local name, *Tambis*, Dinagat and Basilan.

33. **Eugenia javanica** Lam. Encycl. 3 (1789) 200, pro maxima parte.

? E. jambos Blanco Fl. Filip. (1837) 416, non Linn. Sp. Pl. (1753) 470.

Jambosa alba G. Don Gen. Hist. Dichl. Pl. 2 (1832) 868.

LUZON, Province of Rizal, Manila, *Ahern 735, Merrill 4106, Bur. Sci. 6710 Robinson.*

Unfortunately, the three species *E. javanica, E. calubcob,* and *E. mindanaensis*

must be left in an unsatisfactory condition. *E. subrotundifolia* is undoubtedly allied, but quite distinct. *E. mindanaensis* seems separable in the herbarium by its smaller flowers, but is probably closer to what is here named *E. javanica.*

Regarding the remaining two, there seems to be no tangible method of separating them in the herbarium except by at least nearly mature fruit. When living trees at that stage are examined, there is no doubt possible as to their distinctness. The calyx-lobes of the "calubcob" have retained their size at flowering, are not thickened, and are widespreading or reflexed; the disk between them being nearly flat: the other species, here locally called "macupa," has the calyx-lobes very fleshy, incurved and nearly concealing the disk. The trees are different in habit, and the two can be compared side by side in the Manila Botanical Gardens.

In attempting to correlate these with the species of other countries, there is considerable difficulty. *E. javanica* and *E. subglauca* Koord. & Val. are constantly separable by the leaves, those of the former having the odor of cinnamon, those of the latter entirely odorless. This test is of no assistance here. Leaves taken from the two trees above mentioned were at once compared, and both when crushed, had the same odor, which did not suggest that of cinnamon or of cloves to any of several persons present. To me, the odor most strongly suggests that of similarly crushed leaves of *Myrica carolinensis* of the Atlantic coast of North America; the fruit, which rarely contains seeds, has a faintly coniferous taste.

"Macupa" seems not to exist in the Philippines apart from cultivation, "calubcob" is widely distributed, usually if not always along streams, and is in all probability indigenous. All attempts to satisfactorily identify it with exotic species having failed, it is here described as new.

It has been the custom to reduce *E. jambos* Blanco to *E. malaccensis* Linn., but it much more likely belongs here. I have not been able to get any record of *E. malaccensis* anywhere in the neighborhood of Manila.

34. **Eugenia calubcob** sp. nov.

E. montana Naves in Fl. Filip. ed. 3 (1877) *pl. 145*, dubie Blanco l. c. (1837) 416, non aliorum.

E. javanica Auct. Philip., pro majore parte, non Lam. l. c.

Inflorescentiis saepissime terminalibus, sed etiam in ramis subtus foliis suffultis, floribus sessilibus vel pedicellatis, spurie racemose vel subcorymbose dispositis: calycis lobis 4, rotundatis, sub fructu nec incrassatis nec incurvatis; petalis 4, liberis: foliis chartaceis, lanceolatis ad ovalibus, basi cordatis vel obtusis, apice breviter obtuse acuminatis; venis utrinque 10–15.

Inflorescences on any part of the branch from below the leaves to the apex, 6–18 cm long, including the flowers, the individual flowers sessile or with pedicels up to 5 mm long, usually in threes at the apices of the branches of the cyme, or often solitary on its lower branches, then falsely longer-pedicelled: calyx-tube turbinate, about 1 cm in length to the bases of the lobes and there of about 1 cm diameter; calyx-lobes 4, 2.5–5 mm long, 4–7 mm wide at the base, the apex rounded; petals 4, free, white, orbicular-ovate, 6–8 mm in diameter; disk thick; stamens numerous, the filaments 10–15 mm long, the anthers about 0.7 mm long; style 2.5–3.5 cm long; ovary 2-celled, each cell with several ovules: fruit edible, 2–3 cm in diameter, the calyx-lobes withering-persisting, erect, spreading, or recurved, not becoming fleshy, nor strongly incurved, the disk flat or nearly so, 1-celled, not more than one perfect seed found.

Varying from a shrub to a tree 30 m high, with a trunk-diameter up to 55 cm, the branches covered with grayish to dark-reddish bark, the branchlets usually drooping, with a tendency to red also frequently seen on dried leaves: leaves subsessile or with petioles up to 6 mm long, the lamina chartaceous, pellucid-punctate, lanceolate to elliptic, oblong, or oval, 7.5–23 cm long, 2–10 cm wide, the base cordate or obtuse, the apex forming a short and blunt acumen; primary lateral veins on each side of the midrib 10–15, submarginal veins two or more, the basal veins usually not strongly uniting with the more apical.

BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 3986 Fénix.* LUZON, Province of Ilocos Sur, Dolores, *For. Bur. 7118 Klemme:* Province of Benguet, Twin Peaks, *Elmer 6350, For. Bur. 10807 Curran:* Province of Nueva Ecija, near San José, *For. Bur. 8463 Curran:* Province of Pampanga, Arayat, *Merrill 1378:* Province of Bulacan, Angat, *For. Bur. 11172 Aguilar;* Norzagaray, *For. Bur. 7201 Curran:* Province of Rizal, Manila, *Bur. Sci. 6789 Robinson;* Bosoboso, *Bur. Sci. 6756 Robinson* (type), *Merrill 1885, For. Bur. 2860 Ahern's collector;* San Mateo, *For. Bur. 1106 Ahern's collector;* Antipolo, *Merrill 1702, Bur. Sci. 2187 Ramos;* Tanay, *Merrill 2299:* Province of Laguna, Santa Maria Mavitac, *For. Bur. 10078 Curran;* Mavitac, *Bur. Sci. 6533 Robinson:* Province of Batangas, San Juan, *For. Bur. 7714 Curran & Merritt:* Province of Tayabas, Tinuan River, *Whitford 819;* San Andreas, *For. Bur. 10349 Curran;* Hingoso, *For. Bur. 10286 Curran;* Catanauan, *For. Bur. 6616 Kobbe:* Province of Camarines, Pasacao, *Ahern 38, 143, 145:* Province of Albay, *Cuming 888.* MINDORO, *Cuming 1505;* Mangarin, *For. Bur. 9787 Merritt;* Pola, *Merrill 2379;* Iriron, *For. Bur. 9700 Merritt;* Dungay River valley, *For. Bur. 4040 Merritt;* Busuangan, *For. Bur. 9728 Merritt;* Pinamalayan, *For. Bur. 5384 Merritt.* GUIMARAS, Nueva Valencia, *For. Bur. 6483 Everett.* BALABAC, *Bur. Sci. 393 Mangubat.*

In contrast to its botanical difficulties, there is probably no other Philippine species so definitely recognized throughout Luzon, except "duhat" (*E. jambolana*), the names being mostly mere variants of that here adopted for the specific name, appearing on different sheets as *Calubcob, calobcob, calubcub, cupcup, calugcog, carobcob, cayogpug, calopcop,* the last from Mindoro: from Pinamalayan and Nueva Ecija comes the almost inevitable *malaruhat,* and on two sheets, one of them with a query, it is called *tampoi,* which belongs more properly to *E. jambos.* The Mangyans of southwestern Mindoro know it as *tuoy,* and in Abra it is *baracbac.*

35. **Eugenia cinnamomea** Vidal Phan. Cuming. Philip. (1885) 173.

E. pellucida F.-Vill. Noviss. App. (1880) 85, non Duthie, in Hook. f. Fl. Br. Ind. 4 (1878) 485.

LUZON, Province of Ilocos Norte, *For. Bur. 13910 Merritt & Darling:* Province of Zambales, *For. Bur. 6921 Curran;* Iba, *For. Bur. 11047 Zschokke:* Province of Rizal, Bosoboso, *Merrill 1864:* Province of Albay, *Cuming 846.* MINDORO, Baco, *Merrill 1175;* Maugao, *For. Bur. 9847 Merritt.*

Local names, *Langlangis,* Ilocos; *Guenayang,* Rizal; *Pusopuso,* Mindoro.

Endemic.

36. **Eugenia williamsii** sp. nov.

Floribus terminalibus, corymbosis, pedicellatis: calycis lobis 4, inaequalibus, patentibus; petalis 4, liberis; staminibus numerosis: foliis oblongis, anguste oblongis vel ellipticis, basi acutis, apice acute acuminatis.

Flowers forming a terminal, trichotomous, divaricate, corymbose cyme

5 cm long, the rachis and its branches purplish, subterete, bearing very short wide bracteoles at its forks, pedicels 2.5–4 mm long: calyx-tube 6–8 mm long, 2.5 mm wide at the base of the lobes, thence uniformly narrowed to its base; calyx-lobes 4, unequal, the larger 3.5 mm long, 5.5 mm wide, the smaller 3 mm long, 3.5 mm wide, rounded or barely and very obtusely acuminate at the apex; petals 4, white, 8 mm long, 6 mm wide; staminal disk thick; stamens about 100, the filaments 14–20 mm long, anthers 0.8 mm long; ovary 2-celled, the lumen forming slightly more than half the diameter of the ovary, each cell containing many ovules: fruit including the persistent calyx-lobes nearly 3 cm long, ovoid, thin-walled, 1-celled, 1-seeded.

A tree, 12–15 m high, its trunk 12.5–20 cm in diameter, the branches covered with reddish or blackish bark, which cracks when dry, that of the ultimate branches grayish or brownish, together with the petioles and the inflorescence more or less densely covered with brown or purplish glandular hairs: leaves with petioles 6–9 mm long, the lamina subcoriaceous, upper surface shining, olivaceous, under surface reddish or brown and dull, oblong, narrowly oblong, or elliptic, 7–13 cm long, 2.5–6.5 cm wide, acute or very shortly acuminate and decurrent at the base, the apex usually prolonged into a subacute acumen about 1 cm long; primary lateral veins on each side of the midrib 9–12, submarginal vein indefinite.

MINDANAO, District of Zamboanga, Sax River, *Williams 2128*. BASILAN, Binuagan, *For. Bur. 6119 Hutchinson*.

Closely allied to *E. cinnamomea* Vidal, differing not only by its acute leaf-tips, but by the smaller flowers, and less distinct venation.

Local name, *Malatambis*, Basilan.

37. **Eugenia longiflora** F.-Vill. Noviss. App. (1880) 86.

Syzygium longiflorum Presl Bot. Bemerk. (1844) 70.

Eugenia marivelesensis Merr. in Philip. Jour. Sci. 1 (1906) Suppl. 106.

Jambosa lineata Merr. in For. Bur. Bull. (Philip.) 1 (1903) 43, pro parte, non DC. Prodr. 3 (1828) 287.

LUZON, Province of Cagayan, *Cuming 1296:* Province of Principe, Baler, *Merrill 1069:* Province of Isabela, Cauayan, *Bur. Sci. 7978 Ramos:* Province of Rizal, San Mateo, *For. Bur. 1133 Ahern's collector;* Tanay, *Merrill 2342:* Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 618, 1522, 2922 Borden, For. Bur. 2597 Meyer:* Province of Tayabas, Piapi, *For. Bur. 10129 Curran;* Lucban, *Elmer 8241, 9089;* Gumaca, *For. Bur. 6073 Kobbé.* PALAWAN, Dawara trail, *For. Bur. 7431 Manalo;* Iwahig River, *Merrill 757* neither quite typical. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 912:* District of Zamboanga, Tetuan, *Ahern 593.* NEGROS, Mount Silay, *For. Bur. 7266 Everett.*

The identification of Presl's and Merrill's species is made by description, added to the fact that the type of the former was collected by Cuming. In all floral characters it belongs to *Jambosa*, but the leaf-venation is close, as is more usual in *Syzygium*. *Cuming 1296* is listed by Vidal as a *Syzygium*, and the description agrees exactly with that number and with no other species of *Eugenia* collected by Cuming.

This species is almost identical vegetatively with *E. lineata* (Blume) Duthie,

and the inflorescence and flowers are also similar, but not identical. The flowers and the calyx-lobes of *E. longiflora* are much the larger, probably sufficiently so to hold the species distinct. Incidentally, the name *E. lineata* is not tenable for the Indo-Javan species, as it is preoccupied as such by *E. lineata* DC. Prodr. 3 (1828) 273, a West Indian species, and as *Myrthus lineata* (*liniata*) Blume Bijdr. (1826) 1087, is similarly antedated by the original of the latter, *Myrtus lineata* Sw. Fl. Ind. Occid. (1800) 891. Assuming the correctness of the reduction by Koorders & Valeton, its oldest tenable name seems to be *E. cerasiformis* DC. Prodr. 3 (1828) 274, based on *Myrtus cerasiformis* Blume Bijdr. (1826) 1088.

Local names, *Malaruhat*, Baler, Lamao, Piapi, Mindoro, and Gumaca; *Guisihan* at Tanay.

Endemic.

38. **Eugenia macgregorii** sp. nov.

Syzygium caryophyllæceum Merr. in For. Bur. Bull. (Philip.) 1 (1903) 44, non *S. caryophyllaeum* Gaertn. Fruct. 1 (1788) 186, *pl. 33.*

Inflorescentiis terminalibus vel subterminalibus, cymosis: calycis tubo turbinato, lobis 4, rotundatis; petalis liberis; staminibus numerosis, antheris minutis: foliis ellipticis vel ovalibus, basi acutis, apice rotundatis vel breviter obtuse acuminatis; venis utrinque 14–17.

Cymes terminal, widely branched, many-flowered, 5–7 cm long, the individual flowers sessile or a few of them on pedicels 1–2 mm long: calyx-tube turbinate, 6.5–7.5 mm long, of which the basal half is greatly narrowed, 4–6 mm wide at the base of the lobes; calyx-lobes 4, rounded, 1.5 mm long, 3–4 mm wide; petals 4, white, 4–5 mm in diameter, certainly usually free, possibly sometimes falling calyptrately; disk thin; stamens numerous, the filaments 8–9 mm long, the anthers 0.3 mm long; style about 1 cm long; ovary 2-celled.

A small tree, attaining a height of 12 m and a trunk-diameter of 30 cm, the branchlets covered with grayish to brownish bark: leaves with petioles 5–10 mm long, the lamina subcoriaceous, purplish-brown, elliptic, oblong-elliptic, oval, or obovate, 4.5–10.5 cm long, 2.5–8 cm wide, the base acute the apex rounded, retuse, or more often forming a very short and broadly obtuse acumen; primary lateral veins on each side of the midrib 14–17, often but little more conspicuous than some of the secondaries, forming a definite vein near the margin, and frequently an irregular much less conspicuous outer vein extending through the basal two-thirds of the leaf.

Bohol, Tagbilaran, *McGregor 1279* (type); Guindulman, *McGregor 1260.* Masbate, Bulo River, *For. Bur. 1707 Clark.* Negros, Province of Negros Occidental, San Carlos, *For. Bur. 12407 Danao.* Mindoro, Calapan, *For. Bur. 5307 Merritt.* Tinago, *Ahern 424.* Mindanao, Lake Lanao, Camp Keithley, *Mrs. Clemens 1201.*

The type was collected on cliffs along the coast, Clark and Danao obtained their material in mangrove swamps, and the former reports the fruit as black and edible.

Name given doubtfully from Negros as *Malatampoy;* from Tinago as *Palo Maria*, which belongs to *Calophyllum inophyllum.*

39. **Eugenia leptogyna** sp. nov.

Inflorescentiis terminalibus vel subterminalibus, cymosis, floribus pedicellatis vel rarius sessilis; calycis tubo angusto, medio vel supra medium sensim incrassato, sub apice iterum angustato, apice late divaricato, lobis 4, rotundatis; petalis 4, liberis; disco evoluto; staminibus numerosis; foliis chartaceis, oblongo-lanceolatis vel lanceolatis, basi acutis, apice acuminatis; venis utrinque 15–18.

Inflorescences terminal or subterminal, cymose, 5–9 cm long, 1–11-flowered, the individual flowers on pedicels 5–12 mm long, or sessile; calyx-tube 15–21 mm long, at the base 1 mm or slightly more in diameter, in the middle or above the middle swollen to 2.5 mm, below the apex again contracted to 2 mm, near the apex widely spreading and about 8 mm at the base of the lobes; lobes 4, widely rounded, 3.5–5 mm long, 6–8 mm wide; petals 4, white, orbicular-ovate to oval, 8–10 mm in diameter; disk present; stamens numerous, the filaments about 2 cm long, the anthers nearly 1 mm long; style 3–3.5 cm long, persistent; ovary within the swollen portion of the calyx-tube, 2-celled.

A tree 25 m high, its trunk 32 cm in diameter, the somewhat slender branchlets covered with gray or brownish bark; leaves with petioles 6–10 mm long, the lamina chartaceous, oblong-lanceolate or lanceolate, rarely oblong, 8–16 cm long, 2–5 cm wide, the base acute, the apex contracted into a somewhat slender obtuse acumen; primary lateral veins on each side of the midrib 15–18, forming a definite submarginal vein and one or two fainter ones between it and the margin.

MINDORO, south of Lake Naujan, in hill forests at 50 m elevation, *For. Bur. 6839 Merritt.* Very remarkable among Philippines species for its very slender calyx-tube.

The flowers are noted as very fragrant.

Very closely related to *E. cylindrica* Wight. The figure of the latter in the Icones *pl. 528* may well stand for the present species except for the venation of the leaves, which is distinctly different, and said by Duthie[10] to be very characteristic of the Indian species. I can not reconcile his description of the venation with the figure, and our species differs from both, there being two submarginal veins, not at all unusual in the genus, but the inner is very much nearer the margin than halfway.

40. **Eugenia sulcistyla** sp. nov.

Inflorescentiis terminalibus cymosis, alabastris ellipsoideis: calycis lobis 4, rotundatis, stylis longitudinaliter sulcatis: foliis ellipticis, anguste ellipticis, oblanceolatis, vel ovalibus, basi acutis, apice acuminatis, venis utrinque 15–20.

Cymes terminal, in late bud nearly 5 cm long, few-flowered, the pedicels 3.5–13 mm long, with a pair of small inconspicuous bracteoles at the articulation with the flower: calyx-tube brown, 17 mm long, 7–8 mm wide at the base of the lobes, with them nearly ellipsoid in outline,

[10] Fl. Br. Ind. 2 (1878) 480.

extending about 7 mm beyond the ovary the basal 2 mm forming a pseudostalk; lobes 4, rounded, 4–6 mm long, 8 mm wide, the inner pair slightly longer than the outer; petals 4, suborbicular, 5–6 mm in diameter; disk evident; stamens numerous, the filaments still only about 5 mm long, the anthers about 1 mm long; style 6 mm long, with several rather conspicuous longitudinal grooves as in *E. jambos* and *E. merrittiana;* ovary close beneath the base of the style, 2-celled, with several ovules.

A tree, its dimensions not stated, the trunk with pinkish-gray bark, the branchlets with grayish or brownish bark: leaves with rather stout petioles 5–10 mm long, the lamina coriaceous, elliptic, narrowly elliptic, oblanceolate, or oval, the base acute and decurrent, the apex forming an obtuse acumen about 1.5 cm long; primary lateral veins on each side of the midrib 15–20, with occasional well defined secondaries, forming a definite submarginal vein, the venation nowhere except the midrib very conspicuous.

LUZON, Province of Benguet, Losod, *For. Bur. 15873 Bacani.*

41. **Eugenia jambos** Linn. Sp. Pl. (1753) 470.

E. malaccensis Blanco Fl. Filip. (1837) 416, saltem pro parte, non Linn. Sp. Pl. (1753) 470.

Jambosa vulgaris DC. Prodr. 3 (1828) 286.

LUZON, Province of Cagayan, *For. Bur. 18445, 18510 Alvarez:* Province of Rizal, Antipolo, *Merrill 1673;* Manila, *Merrill 4105.* NEGROS, Province of Occidental Negros, Gimagaan River, *Whitford 1645.* PANAY, *Cuming 1648.* SAMAR, *Cuming 1903.*

Local names, *Tampoi, Tampui, Tampul.*

Widely cultivated in the tropics.

42. **Eugenia merrittiana** sp. nov.

Floribus terminalibus, cymosis et corymbosis, haud pedicellatis, purpureis, speciosis, tetrameris; calycis lobis inaequalibus, deciduis; disco stamineo incrassato; staminibus numerosis, filamentis compressis; ovario 2-loculari: foliis breviter petiolatis vel subsessilibus, oblongis vel ellipticis, basi acutis decurrentibusque, apice breviter acuminatis; nervis utrinque 18–25, apicem versus inconspicuis.

Flowers arranged in terminal corymbs or cymes 6–8 cm long, the terminal flower sometimes the oldest, sometimes the youngest, the rachis and its branches angled or terete, 1.5–2.5 mm in diameter, its branches 1–3-flowered with no proper pedicels or these 1 mm long, bractlets wanting: calyx-tube in all 12–22 mm long, the basal 4–11 mm differentiated into a pseudostalk, the upper portion campanulate, 8–9 mm in diameter at the base of the lobes; calyx-lobes 4, very unequal, 2–7 mm long, 4–7 mm wide, broadly rounded, deciduous; petals 4, 5.5–6 mm long, 6.5–8 mm wide, purple, rounded, conspicuously glandular; staminal disk moderately thick; stamens about 150, the filaments flattened, about 0.4 mm wide, 12–26 mm long, the anthers oblong, 0.6 mm long, 0.4 mm wide; style 1.5 cm long; ovary 2-celled with several ovules in each cell, ovarian walls rather thick.

A tree attaining a height of at least 15 m with a trunk 70 cm in diameter, the bark of the ultimate branches purplish-black or streaked with grayish-brown, somewhat striate; leaves opposite, the lamina coriaceous, olivaceous or brown when dry, oblong or elliptic, 6–15 cm long, 2.5–5.5 cm wide, the apex shortly acuminate, at the acute base prolonged sometimes almost to the insertion of the petiole, sometimes ending as much as 6 mm from it; the under surface conspicuously glandular; primary lateral veins on each side of the midrib 18–25, becoming very inconspicuous toward the extremes.

LUZON, Province of Rizal, Montalban, *Bur. Sci. 5198 Ramos* (type); Bosoboso, *For. Bur. 3177 Ahern's collector:* Province of Albay, Batan Island, Calanaga, *Bur. Sci. 6292 Robinson.* MINDORO, Paluan, *For. Bur. 9920, 9941 Merritt;* Cayacyan River, *For. Bur. 9751 Merritt.*

Local name, *Tumulod*, at the last-mentioned locality.

43. **Eugenia xanthophylla** sp. nov.

Floribus axillaribus, lateralibus, rarissime terminalibus, cymosis, magnis, tetrameris, pedicellatis; calycis tubo turbinato, basi haud protracto; disco stamineo crasso; staminibus numerosissimis; ovario 2-loculari: foliis breviter pedicellatis, lineari-oblongis, oblongis, vel ellipticis, basi acutis decurrentibusque, apice breviter acuminatis; venis utrinque 15–25.

Flowers cymose, axillary, or at the apices of short lateral branches, very rarely truly terminal, the cymes 1–9-flowered, in all 3–5 cm long, the pedicels 2–12 mm long, with a pair of deciduous bractlets at their apex: calyx-tube sometimes narrowed to form a pseudostalk for 1.5–3 mm, sometimes rounded to the base, turbinate, 1.6–1.7 cm long, 1.4–1.5 cm in diameter at the base of the lobes; prolonged 8–10 mm beyond the ovary, calyx-lobes 4, unequal, broadly rounded, the larger 5 mm long and 11 mm wide, the smaller 3.5 mm long and 8 mm wide; petals 4, white or rose, broadly oval or ovate, 8–10 mm long, 7–9 mm wide, occasionally with one or more smaller petals within and opposite the others; staminal disk thick; stamens over 1,000, the filaments 1.5–2 cm long, the anthers 1.2 mm long; style 2–3 cm long; ovary 2-celled, with numerous small ovules arranged in 10–12 rows; fruit edible, attaining a diameter of 2.5 cm, its walls about 1.5 mm in thickness.

A small tree, attaining a height of 20 m, usually less, with pinkish-gray bark, that of the ultimate branches gray, smooth; leaves borne on petioles 3–8 mm long, the lamina chartaceous, glandular-punctate, linear-oblong to oblong or elliptic, 6–24 cm long, 2–4.8 cm wide, acute and decurrent at the base, at the apex forming a short acute or obtuse acumen, the upper surface when dry pale-olivaceous-green to brownish, the under surface always paler, usually yellowish; primary lateral veins on each side of the midrib 15–25, some of the secondary veins often prominent, submarginal vein distinct.

LUZON, Province of Abra, Baco, *For. Bur. 14662 Darling:* Province of Nueva Ecija, Carranglan, *Merrill 293;* Cuyapo, *For. Bur. 9596 Zschokke:* Province of

Zambales, Mount Malinta, Subig, *For. Bur. 7015 Curran;* Masinloc, *Merrill 2945;* Rio Baquiling, *For. Bur. 6965 Curran;* Botolan, *Merrill 2930:* Province of Bulacan, Angat, *For. Bur. 11171 Aguilar;* Norzagaray, *For. Bur. 7211 Curran* (type): Province of Rizal, Bosoboso, *Merrill 2646, For. Bur. 3083 Ahern's collector;* Antipolo, *Bur. Sci. 5200 Ramos:* Province of Tayabas, Guinayangan, *For. Bur. 12267 Rosenbluth:* Province of Sorsogon, Castila, *For. Bur. 15005 Aldor.* MINDORO, Budburin, *For. Bur. 9875 Merritt* (not typical). NEGROS, Province of Occidental Negros, Gimagaan River, *For. Bur. 4296 Everett.*

Local names, *Balabac, Balocboc,* Zambales; *Balacbat,* Abra; *Baracbac,* Nueva Ecija; *Bislot,* Rizal; *Cayococ,* Tayabas; *Lapinig,* Sorsogon; *Malatampoy,* Negros; *Tampuy,* Mindoro.

44. **Eugenia triphylla** sp. nov.

Inflorescentiis axillaribus, brevissimis, trifloris: floribus magnis, tetrameris; foliis brevissime petiolatis, lanceolatis, anguste ellipticis, vel oblanceolatis, basi acutis, decurrentibus, apice obtuse vel saepius subacute acuminatis, venis utrinque 15–20.

Inflorescence axillary, the peduncles 2 mm long, pedicels none or coalesced with the peduncle; calyx-tube campanulate, 1.3 cm long, 2 cm wide at the base of the lobes; calyx-lobes 4, 3–6 mm long, about 1 cm wide; petals 4, pink, nearly orbicular, slightly exceeding 1 cm in diameter; stamens very numerous, the white filaments attaining a length of 2.5 cm, the anthers about 0.8 mm long; style nearly 4 cm long.

A tree 10 m high, the branchlets covered with gray or yellowish bark, below terete, near the apices more or less angled; leaves in threes, with petioles 0.5–2 mm long, lamina subcoriaceous, lanceolate, narrowly elliptic, or oblanceolate, 4–9 cm long, 1–2.5 cm wide, the base acute, sometimes spatulate, decurrent, the apex acuminate, sometimes obtusely, more often subacutely; primary lateral veins on each side of the midrib 15–20, not very prominent, forming a somewhat faint but definite vein close to the involute margins.

BASILAN, banks of Basilan River, at 150 m elevation, *For. Bur. 3971 Hutchinson.*

Very similar to *E. xanthophylla,* but apparently distinguished not only by the number of the leaves, but also by having somewhat larger flowers without pedicels, and by the venation of the leaves.

Local name, *Tubaltubal.*

45. **Eugenia everettii** sp. nov.

Floribus terminalibus, solitariis vel paucis, tetrameris, magnis; sepalis valde inaequalibus; petalis liberis; disco stamineo crasso; staminibus numerosissimis, filamentis teneribus; ovario 2-loculari: foliis lanceolatis vel ellipticis, breviter petiolatis, chartaceis, basi acutis, apice subacute acuminatis; venis utrinque 8–12.

Cymes terminal at the apex of the larger or of short lateral branchlets, 1–3-flowered, peduncles and pedicels almost or entirely wanting: flower-buds nearly ovoid to turbinate; calyx-tube 1.1–1.5 cm long at anthesis, and over 1 cm wide at the base of the lobes, extending 6 mm or more

beyond the ovary, the upper portion often more or less reflexed in fruit; calyx-lobes 4, unequal, somewhat distant, the larger 6 mm long and 6 mm wide, the smaller 1.5–2 mm long, 4–5 mm wide, all rounded; petals 4, white, orbicular-ovate, 7–8 mm long, 6–7 mm wide; staminal disk thick; stamens very numerous, their slender filaments 1.5–2.5 cm long, their anthers 1.5 mm long; ovary 2-celled, with many ovules; style 2–3.5 cm long.

A small tree attaining 15 m in height, the bark of the ultimate branches gray: leaves with petioles 3–7 mm long, the lamina chartaceous or subcoriaceous, lanceolate, elliptic or oblong-elliptic, 5–13 cm long, 2.5–5 cm wide, acute and slightly decurrent at the base, the apex prolonged into a short subacute acumen; lateral veins 8–12, always forming a definite submarginal vein, and on the broader leaves often a fainter outer one.

LUZON, Province of Camarines, near Lagonoy, *For. Bur. 10651 Curran.* NEGROS, Province of Negros Occidental, Mount Silay, *Whitford 1496 Whitford & Everrett.* MINDANAO, District of Zamboanga, Sax River, *Williams 2110, 2189.*

Whitford 1612, from Gimagaan River, Negros, resembles this species in some respects, but flowers are pedicelled, their attachment unknown, and while it may possibly serve as a link with *E. xanthophylla*, it is more probably distinct from both.

46. **Eugenia vidaliana** Elmer Leafl. Philip. Bot. (1909) 584.

Inflorescentiis terminalibus, fructibus subglobosis, unilocularibus, monospermis, 2 cm diametro; calycis lobis 4, persistentibus, 2–6 mm longis, 4–5 mm latis; disco evoluto; staminum maculis numerosis: foliis petiolis circiter 1 cm longis suffultis, laminis chartaceis, oblanceolatis vel ellipticis, 7–13 cm longis, 23–45 mm latis, basi acutis, apice breviter obtuse acuminatis; venis utrinque 5–8.

LUZON, Province of Tayabas, Lucban, *Elmer 9161;* Guinayangan, *For. Bur. 12806 Rosenbluth,* the latter in flower. The flowers are white, fragrant, the calyx-tube is turbinate, or nearly funnel-form, petals 4, suborbicular, 7–8 mm in diameter; filaments 8–10 mm long; style little exceeding 1 cm: leaves slightly wider than in the type, the veins both on this and the cotype 10–12: the inflorescence is a terminal interrupted, leafy, trichotomous cyme, with the flowers solitary or in threes at the apices of its ultimate branches, on pedicels 0.5–2 mm long or rarely sessile.

Local name, *Macaasim.*

Endemic.

47. **Eugenia brunnea** sp. nov.

Floribus paniculatis, pedicellis 1.2–2 cm longis, calycis lobis tubum aequantibus vel superantibus, 4; petalis 4, separatim deciduis; staminibus numerosis; ovario 2-loculari: foliis ellipticis ovatis vel ovalibus; venis utrinque 9–11.

Flowers forming terminal or lateral 3–7-flowered panicles 4–7 cm long, the rachis and its branches obscurely 4-angled or terete; flowers borne on pedicels 1.2–2 cm long, with no pseudostalk or a very short one; tube of the calyx turbinate, 5 mm long, 7 mm in diameter at the base of the lobes; lobes 4, nearly equal, the larger 6 mm long and 8 mm wide, broadly

rounded; petals 4, suborbicular, 8 mm in diameter; staminal disk thickened; stamens very numerous, their filaments slender, 1–1.5 cm long, their anthers oblong, 0.7 mm long; style about 2.5 cm long; ovary 2-celled, its lumen very short, and only one-third of the total width of the ovary: fruit globose, 2 cm in diameter, crowned by the persistent erect or incurved calyx-lobes and the base of the style, its surface marked by many obscure longitudinal lines.

A tree of unknown size, the bark of the ultimate branches gray, or on innovations darker; leaves borne on petioles 5–11 mm long, the lamina coriaceous or subcoriaceous, when dry brown or olivaceous, oval, elliptic, or ovate, 5.5–12 cm long, 2.7–6.3 cm wide, gradually or abruptly acute at the base, decurrent on the petiole, acuminate at the apex; primary lateral veins on each side of the midrib 9–11, irregular near the margins, forming a definite submarginal vein at least beyond the middle of the leaf, or through incomplete anastomosis two or three submarginal veins.

LUZON, Province of Principe, Baler, *Merrill 1069 bis* (type), *1088*.
Local names, *Malaruhat, Malabayabas*.

48. **Eugenia squamifera** sp. nov.

Cymis terminalibus vel lateralibus, 1–7-floris, floribus mediocriter pedicellatis, magnis, tetrameris: foliis lanceolatis vel oblongis, basi acutis, apice breviter obtuseque acuminatis; venis utrinque 9–12: nodis saepe squamiferis.

Cymes terminal or lateral, 4–5 cm long, 1–7-flowered, the peduncles and pedicels terete, the latter 5–12 mm long, with a pair of small bracteoles at the articulation with the pseudostalk, and several purplish linear-lanceolate acute scales 3–5.5 mm long at the base of the peduncle or sometimes at the insertion of the pedicels or at the forks of the branchlets or in the axils of the leaves: calyx-tube turbinate, at the base narrowed into a pseudostalk 2 mm long, in all 1.5–2 cm long and about 1.5 cm in diameter at the base of the lobes; calyx-lobes 4, unequal, the larger 4–6 mm long, 7–8 mm wide, the smaller 2–3 mm long, 6 mm wide; petals 4, white, obovate-orbicular, 9 mm in diameter, acuminate at the apex or irregular in shape and smaller; staminal disk thick; stamens about 600, their filaments 14–21 mm long, their anthers 1.4 mm long; style 2.5 cm long; ovary thick-walled, 2-celled, with few ovules.

A tree 4 m high, its trunk-diameter 10 cm, branches covered with gray or purplish-brown bark, that of the ultimate ones smooth and shining: leaves with stout purplish petioles 3–6 mm long, the lamina coriaceous, olivaceous on the upper surface, pale-green beneath, lanceolate to oblong or elliptic, 9–18 cm long, 3–7 cm wide, very shortly acuminate and decurrent at the base, the apex shortly and obtusely acuminate; primary lateral veins on each side of the midrib 9–12, widely separated, in the middle of the leaf 2 cm apart or even more.

LUZON, Province of Zambales, Mount Balingbuaya, *For. Bur. 8243 Curran & Merritt.*

49. **Eugenia megalantha** sp. nov.

Cymis terminalibus, axillaribus, vel in ramis vetustioribus; floribus plerumque longe pedicellatis, magnis, tetrameris, ovario 1- vel 2-loculari: foliis lanceolatis, oblanceolatis, vel oblongis, basi acutis, apice obtuse acuminatis vel haud acuminatis, angustioribus saepe falcatis, venis utrinque 11–15.

Cymes 1–5-flowered, terminal or in the axils of present or fallen leaves, the peduncles very short, the pedicels fascicled, usually long, ranging from 5 to 27 mm, bearing a pair of minute bracteoles at their articulation with the pseudostalk, and sometimes at least a few bract-like scales at the articulation with the peduncle: flowers white: calyx-tube turbinate, in all 1.9–3 cm long, including a well-defined pseudostalk 2–6 mm long, at anthesis 2–2.5 cm in diameter at the base of the lobes, extending about 1.5 cm beyond the ovary; calyx-lobes 4, unequal, 7–9 mm long, 1–2 cm wide, rounded, splitting; petals 4, 1.3–1.5 cm long, 1.2–1.6 cm wide, narrowed into a thick claw at the base; staminal disk very thick; stamens very numerous, the filaments 1.5–3 cm long, the anthers 1.6 mm long; style 4 cm long; ovary 1- or unequally 2-celled, with numerous small ovules.

A spreading tree 8–12 m high, with a trunk 10–20 cm in diameter, the bark of the ultimate branches pale-gray: leaves with stout purple petioles 3–8 mm long, the lamina subcoriaceous or chartaceous, lanceolate, oblanceolate, or narrowly oblong or elliptic, 10–16 cm long, 2.4–5.4 cm wide, at the base acute and somewhat decurrent, when seen from beneath appearing subobtuse, the margins revolute, the apex usually shortly and obtusely acuminate, or on the narrower leaves not acuminate but falcate and nearly acute; primary lateral veins on either side of the midrib 11–15, forming a distinct submarginal vein.

PALAWAN, Iwahig River, *Bur. Sci. 784 Foxworthy.* In foliage resembling *E. robertii,* but widely distinct in its flowers and inflorescence, approaching some specimens of *E. xanthophylla.*

50. **Eugenia robertii** Merr. Philip. Journ. Sci. 1 (1906) Suppl. 106.
E. succulenta Elmer Leafl. 1 (1908) 327.

LUZON, Province of Benguet, Baguio, *Elmer 5988, 8621;* Bued River near Loakan, *For. Bur. 931 Barnes:* Province of Zambales, Mount Balinbuaya, *For. Bur. 8244 Curran & Merritt:* Province of Bataan, Mount Mariveles, *For. Bur. 2636, 2857 Meyer, For. Bur. 6226 Curran, Whitford 349, 1182, 1211:* Province of Rizal, Bosoboso, *For. Bur. 2859 Ahern's collector.* LUBANG, *For. Bur. 12239 Rosenbluth,* with leaves much broader than in the type, oval or almost orbicular, but aparently otherwise identical.
Local name in Bataan doubtfully given as *Malacalubcob.*
Endemic.

51. **Eugenia benguetensis** sp. nov.

Floribus terminalibus, cymosis, crasse pedunculatis, subsessilibus, admodum magnis, tetrameris; calycibus turbinatis, lobis ineaqualibus; petalis liberis, interdum 8; staminibus numerosis; ovario 2-loculari: foliis

oblongis vel ellipticis, subcoriaceis, basi acutis, apice subito breviterque obtuse acuminatis.

Cymes terminal, sessile or subsessile, 3–4.5 cm long, the peduncles 2.5–4 mm thick, strongly 4-angled, trichotomous, the flowers on pedicels 1–2 mm long, usually having a very short margin with several lobes: calyx-tube turbinate, 6–7 mm long, 7–8 mm in diameter at the apex, the lobes 4, unequal, 4–9 mm long, 7–10 mm wide, rounded at the apex, projecting about 2 mm beyond the ovary; petals 4, suborbicular, the base truncate, 8–10 mm long, 9–12 mm wide, sometimes with 4 additional petals, forming an inner row, usually narrower than the outer and irregular in shape; staminal disk rather thick; stamens about 200, the filaments 1–1.5 cm long, the anthers 1.3–1.7 mm long, 0.4 mm wide; ovary 2-celled, the lumen about one-half the diameter of the ovary, each cell containing many ovules; style 1.5 cm long.

Scrubby, tree-like, about 4.5 m high, the wood hard, the bark rather smooth, the ultimate twigs numerous and erect, covered with reddish, becoming grayish bark, terete or the youngest somewhat angled; leaves borne on petioles 5–10 mm long, the lamina glandular-dotted, subcoriaceous, brown when dry, 6–10 cm long, 2.5–4 cm wide, oblong or elliptic, the margins strongly revolute, acute or very shortly acuminate at the base, at the apex suddenly contracted into a short obtuse acumen; primary lateral veins on each side of the midrib 10–12, arching, three or more of them forming submarginal veins, never with the very definite submarginal vein of *E. bordenii.*

LUZON, Province of Benguet, Mount Tonglon (Santo Tomas), *Elmer 6265* (type); Palau, *Loher 2492.*

Distinguishable from *E. bordenii,* not only by the venation, but by larger flowers, much more revolute leaf-margins, stouter peduncles, and the color of the leaves.

52. **Eugenia bordenii** Merr. Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 47.

LUZON, Province of Cagayan, Aparri, *For. Bur. 11276 Klemme:* Province of Rizal, Bosoboso, *Merrill 2671, For. Bur. 3179 Ahern's collector;* Montalban, *For. Bur. 2434 Ahern's collector;* Antipolo, *For. Bur. 393 Ahern's collector:* Province of Bataan, Lamao River, *For. Bur. 328, 492, 497, 540 Barnes, For. Bur. 633, 644, 690, 691, 1206, 1208, 1630, 1736 Borden, Williams 631, 725, Whitford 362:* Province of Camarines, *For. Bur. 10701 Curran.* MINDORO, Bongabong River, *Whitford 1465, For. Bur. 3700 Merritt;* Iriron, *For. Bur. 8841 Merritt.* MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9446, 9470 Whitford & Hutchinson.* BASILAN, *Hallier s. n.*

Endemic.

Local names, *Amtuc, Maramatam,* Cagayan; *Panglomboyen,* Pangasinan; *Bislot, Tayongtayong,* Rizal; *Malaruhat, Malaruhat na puti, Malacalubcub, Apalang, Bataan; Malaruhat, Aropay,* Mindoro.

53. **Eugenia candelabriformis** sp. nov.

Inflorescentiis terminalibus vel pseudo-terminalibus, multifloris, corymboso-cymosis, pluri-articulatis; floribus admodum parvis, tetrameris; calycis tubo turbinato, lobis 4, rotundatis; staminibus admodum paucis:

foliis ellipticis vel elliptico-oblanceolatis, basi acutis vel subacutis, apice breviter obtuse acuminatis; venis utrinque 8–10.

Inflorescences at the apices of the branches, sometimes three-forked from their base, more often the middle fork replaced by a short leaf-bearing branch, many times branched but the flowers nearly level along the top, 6 or 7 articulations intervening between the apex of the stem and the individual flowers, the latter always with pedicels, these often twice or thrice articulated, each articulation except the lowest with a pair of very short but wide rounded and conspicuous bracteoles nearly encircling the pedicels: flowers when dry yellowish or yellowish and purplish except the whitish anthers; calyx-tube turbinate, 4–5 mm long, 4 mm wide at the base of the lobes; lobes 4, 1.5–2.5 mm long, 2.5–3 mm wide, rounded; petals 4, deciduous, apparently falling calyptrately at some times but certainly separating at others, 7–8 mm in diameter; disk present, its rim free from the calyx; stamens about 60, the filaments flat, wide, more or less united at the base, 8–12 mm long; anthers broad, about 1 mm long; style about 1 cm long; ovary 2-celled.

A tree 15 m high, its trunk 25 cm in diameter, the branchlets covered with brownish bark: leaves with petioles 5–8 mm long, the lamina coriaceous, elliptic-oblanceolate or elliptic, 6–8.5 cm long, 2.5–4 cm wide, narrowed toward the base, there often more or less rounded but meeting the petiole at an acute angle, the margins revolute, the apex forming a short obtuse acumen; primary lateral veins on each side of the midrib 8–10, forming two or three definite submarginal veins.

Luzon, Province of Benguet, Sapuan, at an elevation of 1800 m, *For. Bur. 18355 Alvarez.*

N. v., (Igorot), *Silda.*

54. **Eugenia hutchinsonii** Merr. sp. nov.

Inflorescentiis axillaribus, capitatis, capitulis racemose vel spicatim dispositis: calycis tubo subturbinato, basi producto, lobis 4, triangulari-ovatis; petalis 4, liberis; staminibus numerosis: foliis chartaceis, oblanceolatis vel ellipticis, basi acutis, apice anguste acuminatis; venis utrinque 23–35.

Inflorescences in the upper axils, 5–7 cm long, the individual flowers sessile in heads of three or more, the heads sessile or more often pedicelled along the 4-angled axis of the inflorescence: calyx-tube about 7 mm long, of which the basal 3–4 mm forms a definite pseudostalk, 5 mm in diameter at the base of the lobes; calyx-lobes 4, not very unequal, triangular-ovate, 2–3 mm long, 2–3 mm wide at the base; petals 4, free but apparently sometimes falling together, white, suborbicular, 3 mm in diameter; stamens numerous, the filaments 3–4 mm long, the anthers 0.4 mm long; style over 4 mm long; ovary 2-celled, with several ovules.

A tree about 8 m high, the branchlets 4-angled, and narrowly winged, covered with reddish-brown bark; leaves with petioles 6–10 mm long,

the lamina chartaceous, oblanceolate or elliptic, 10–17 cm long, 3–5 cm wide, acutely acuminate and decurrent at the base, at the apex somewhat abruptly contracted into a slender subacute acumen 1.5–2 cm long, the upper surface when dry chocolate-brown, the lower paler-brown; primary lateral veins on each side of the midrib 23–35, not crowded, very distinct, the finer venation quite evident but comparatively inconspicuous, a very definite submarginal vein also extending from base to apex.

BASILAN, between Guion and Malusu, *For. Bur. 4026 Hutchinson.*
Local name, *Malatambis.*

55. **Eugenia lacustris** sp. nov.

Cymis terminalibus vel axillaribus, floribus mediocris: calycis tubo turbinato, lobis 4, rotundatis, inaequalibus; petalis 4, liberis; staminibus numerosis; ovario 2-loculari: foliis coriaceis, ellipticis vel ovalibus, basi acutis, apice anguste acuminatis; venis utrinque 15–20.

Cymes terminal or axillary, 2.5–9 cm long, sessile or peduncled, trichotomous, their branches mostly stout, 4-angled, the flowers in threes, sessile: calyx-tube about 8 mm long, extending about 4 mm beyond the ovary, 7 mm in diameter at the base of the lobes, the basal 3.5 mm or less forming a pseudostalk, turbinate; calyx-lobes 4, the pairs of unequal size, the outer 1.5 mm long and 4 mm wide at the base, the inner 3.5 mm long, 6 mm wide, all rounded at the apex; petals 4, orbicular-ovate, about 4.5 mm long, rounded but sometimes pointed at the apex; stamens numerous, the filaments 7–8 mm long, the anthers 0.3 mm long; style 1.5 cm long; ovary 2-celled with numerous ovules.

Presumably a tree, the branches terete or sometimes angled toward the tips, covered with gray bark: leaves with petioles 3–10 mm long, the lamina coriaceous, elliptic to ovate, 10–23 cm long (few perfect on specimen), 4–11 cm wide, usually inequilateral, the apex somewhat abruptly contracted into a slender acumen about 1 cm long, the base acuminately acute and decurrent; the under surface highly glandular; primary lateral veins on each side of the midrib 15–20, the main submarginal vein originating from the second or third from the base, the more basal veins also continuing almost to the apex.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 299.* "Lacustris" is a translation both of "Lake" and of "Lanao."

56. **Eugenia palawanensis** sp. nov.

Inflorescentiis axillaribus, 7–9 cm longis, floribus in capitulis racemose vel paniculatim dispositis, tetrameris: calycis lobis petalis subsimilibus: foliis petiolatis, lanceolatis vel elliptico-lanceolatis, basi acutis decurrentibusque apice tenuiter acuminatis, venis marginalibus tribus, exteriore vel duabus exterioribus parum conspicuis, interiore valde conspicua, venis utrinque 9–12.

Inflorescences axillary, 7–9 cm long, the peduncles flat or angled, the

individual flowers few in a head, sessile, racemosely or paniculately disposed along the peduncle; calyx-tube in all 5–6 mm long, the lower 2 mm forming a pseudostalk, the upper part shortly campanulate, 6 mm wide at the base of the lobes; calyx-lobes 4, petaloid, 3–3.5 mm long, 4 mm wide; petals varying from broadly ovate to oblanceolate, 3–4 mm long; stamens numerous, the filaments 5–8 mm long, the oval anthers 0.4 mm long; style about 1 cm long; ovary 2-celled.

A tree 10 m high, with a trunk 20 cm in diameter, the bark of the branchlets varying from greenish at the apex to gray at the base, striate and at the apex somewhat flattened; leaves with petioles 5–8 mm long, the lamina chartaceous but rigid, lanceolate or elliptic-lanceolate, 13–19 cm long, 4–5.3 cm wide, the base acuminately acute and decurrent on the petiole; three submarginal veins more or less easily traced from base to apex, the two outer arising from the extreme base of the leaf, and more easily seen on the upper surface owing to the slightly recurved margins, the inner arising from the midrib about 1 cm above the base and very conspicuous throughout, additional primary lateral veins on each side of the midrib 9–12, prominent, many of the secondary veins also prominent but less so than the primary.

PALAWAN, 4 km northeast of Puerto Princesa, in level forest near the bay at 10 m elevation, *For. Bur. 3503 Curran.*

57. **Eugenia philippinensis** sp. nov.

Inflorescentiis terminalibus vel axillaribus, saepissime fasciculatis, floribus albis, saepius apice congestis, mediocris: calycis tubo subturbinato, lobis 4; petalis 4, liberis; staminibus numerosis: foliis petiolatis, laminis coriaceis, ellipticis vel ovalibus, basi acutis, apice anguste acuminatis; venis utrinque 9–14.

Inflorescences terminal or in the axils of usually the upper leaves, solitary or more often fascicled, 3–9 cm long, peduncles 4-angled and more or less longitudinally striate, sparingly or not branched except at its base, the individual flowers sessile or rarely subsessile, clustered at the apex of the peduncle (as many as 12) with a few along its sides: calyx-tube turbinate, 7 mm long, 6 mm wide at the base of the lobes; at the base contracted to a definite pseudostalk; calyx-lobes 4, unequal in pairs, the outer 2.5 mm long, 3 mm wide at the base, the inner similar to the 4 free petals and like them 3–4 mm long, 4–6 mm wide at the base; stamens numerous, the filaments 4–7 mm long, anthers ovate, about 0.7 mm long; style less than 1 cm long; ovary 2-celled, ovules several.

A tree attaining a height of 20 m and a trunk-diameter of 50 cm, its terete branches covered with gray bark: leaves with petioles 6–12 mm long, the lamina coriaceous, elliptic, oblong, oval, or obovate, 6–13 cm long, 3.5–6 cm wide, acutely short-acuminate and decurrent at the base, the apex contracted into a narrow and usually nearly acute acumen 5–15

mm long; primary lateral veins on each side of the midrib 9–14, the second or third pair from the base forming the main submarginal veins, the latter somewhat remote from the margins (in the middle of the leaf usually 4–6 mm), the basal veins forming fainter veins nearer the margin.

LUZON, Province of Tayabas, Guinayangan, *Merrill 2054* (type): Buena Vista Mountain, *For. Bur. 10312 Curran.* LEYTE, Ormoc and vicinity, *For. Bur. 11576, 11644 Whitford, For. Bur. 12761 Rosenbluth.*

Native names, *Macaasin, Malayambo, Bagohion,* Tayabas: *Tambitambi, Tambistambis, Tulambis,* Leyte. Wood used as lumber, for house-posts, and in ship-building.

The species of this group, nos. 54 to 59, are (except the first) very puzzling, and fuller material may necessitate a revision of the species. There is an equal general resemblance between *E. zamboangensis* and *E. arcuatinervia,* but they are definitely separable, as in the latter the calyx is entirely closed in bud, the apex falling calyptrately or remaining attached to one side for a shorter or longer time, simulating a lobe.

58. **Eugenia zamboangensis** sp. nov.

Inflorescentiis axillaribus vel pseudoterminalibus, brevibus, paucifloris, floribus mediocris; calycis tubo turbinato, lobis 4; petalis 4, liberis; staminibus numerosis: foliis chartaceis, subellipticis, basi acutis, apice anguste acuminatis; venis utrinque 9–15.

Inflorescence essentially axillary, though even more often a cyme is situated in the axils of each of the pair of leaves which terminate the branch, 2–4 cm long, sparingly or not branched, bearing usually 5 flowers, 3 at the apex and 2 a short distance below the apex, all flowers sessile; bracteoles short, ovate, obtuse: calyx-tube turbinate, 4–5 mm long, and of about an equal diameter at the base of the lobes, extending about 2 mm beyond the ovary, the lower portion forming a pseudostalk; calyx-lobes 4, unequal in pairs, the one pair 2 mm long and 5 mm wide at the base, petaloid, the other 1.5 mm long and 3 mm wide at the base, not petaloid, all rounded at the apex; petals 4, free, rounded, 2.5 mm long and 3.5 mm wide; stamens numerous, the filaments 6–8 mm long, the anthers 0.4 mm long; style about 1 cm long; ovary 2–celled, each cell with several ovules.

A tree attaining a height of 35 m and a trunk-diameter of 40 cm, its ultimate branches slender, terete, covered with gray bark: leaves with petioles 4–9 mm long, the lamina chartaceous, elliptic, 5–12 cm long, 2–5 cm wide, acutely acuminate and decurrent at the base, the apex forming a slender acumen 1–2 cm long, the under surface very distinctly (under the lens) glandular-dotted; primary lateral veins on each side of the midrib 12–15, rarely fewer, the main submarginal vein formed by the most basal conspicuous lateral vein, though a very faint vein more often intervenes between it and the margin.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9423, 9473* (type) *Whitford & Hutchinson.* BASILAN, *Hallier s. n.*

59. **Eugenia pulgarensis** sp. nov.

Inflorescentiis terminalibus, brevibus, floribus sessilibus in capitulis paucifloris racemose dispositis; calycis lobis inaequalibus, interioribus pro rata magnis; petalis 4, exterioribus saltem liberis: foliis coriaceis, elliptico-oblanceolatis vel obovatis, basi acutis, margine revolutis, apice abrupte obtuseque acuminatis; venis utrinque 10–12.

Inflorescences terminal or subterminal, 2–3 cm long, the 4-angled rachis sometimes united with the branchlets, its branches short, terminated by solitary or few sessile flowers: calyx-tube turbinate, 5–6 mm long, 4–5 mm wide at the base of the lobes; calyx-lobes unequal, the inner orbicular-ovate, 3–4 mm in diameter, deciduous; petals 4, at least the outer free, 2 mm in diameter; stamens numerous, the filaments attaining a length of 4 mm, the anthers orbicular-ovate, 0.5 mm long, conspicuously gland-tipped; style 2.5 mm long; ovary thick-walled, 2-celled, the ovules few.

A tree, its branches covered with grayish bark; leaves with petioles 2–5 mm long, the lamina coriaceous, elliptic-oblanceolate to obovate, 3.5–6.5 cm long, 1.5–3 cm wide, the base acute, the margin revolute, the apex abruptly contracted into an obtuse acumen 2–5 mm long; primary lateral veins on each side of the midrib 10–12, elevated on both surfaces, united by numerous conspicuous anastomoses, their apices forming a definite vein about 1.5 mm within the margin, and a fainter one just within the line of folding.

PALAWAN, Mount Pulgar, where very common, *For. Bur. 3882 Curran.*

60. **Eugenia arcuatinervia** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 104.

LUZON, Province of Cagayan, *Cuming 1275, 1325;* San Vicente, *For. Bur. 7066, 7085 Klemme;* Camalanuigan, *For. Bur. 6669 Klemme:* Province of Bataan, Mount Mariveles, *For. Bur. 2598 Meyer.* MINDORO, Magasanantubig River, *For. Bur. 12198 Rosenbluth.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1063. Cuming 1710,* from Samar, is allied.

This separates into two distinct series, the Mariveles and Mindoro collections going together, while all the Cagayan plants agree with that from Mindanao. The latter are characterized by more coriaceous, fewer-veined leaves, and may prove specifically separable.

Local names *Carutad, Biracbac,* both Negrito, *Pango,* Cagayan, all three from that province: *Malaruhat,* Mindoro.

Endemic.

61. **Eugenia clausa** sp. nov.

Affinis *E. operculatae* Roxb.: inflorescentiis in ramis in axillis defoliatis, paniculato-cymosis: floribus sessilibus, in triadibus dispositis, alabastris ellipsoideis vel obovoideis, apiculatis, calycis superiore parte calyptratim decidua; petalis liberis: foliis longiter petiolatis, chartaceis, ellipticis, elliptico-oblanceolatis, oblongis, ovalibus vel obovatis, basi acutis, apice in acumen brevem obtusum angustatis; venis utrinque 12–20.

Inflorescences on the branches below the leaves, 2.5–5 cm long, one or

more arising from the same axil, paniculately branched, the branchlets terete or subterete, the individual flowers in triads, sessile, with a pair of deciduous ovate or lanceolate bracteoles at the base of each flower, and showing either similar ones or their scars at lower forks: buds 3.5 mm long, ellipsoid to obovoid, strongly apiculate, at first green, later becoming purple from the apex downward, the apical 1.5 mm falling calyptrately leaving a truncate margin; in anthesis the flower including the stamens 7–8 mm long; the remaining portion of the calyx nearly campanulate, elongated to about 3 mm and 3 mm in diameter at the apex, extending 1.5 mm beyond the ovary; petals 4, white, free but falling with the calyx; staminal disk thin; stamens numerous, the filaments 2–3.5 mm long, the anthers 0.4 mm long, the apical gland not very conspicuous; style 4 mm long; ovary 2-celled, many-seeded, the wall showing in section a definite ring of glands.

A tree 15–20 m high, its trunk about 25 cm in diameter, covered with the branches by gray bark, the branchlets green, the nodes somewhat swollen; leaves with petioles 12–20 mm long, the lamina chartaceous, elliptic, oblong, elliptic-oblanceolate, oval or obovate-orbicular, 6.5–14.5 cm long, 3–7.8 cm wide, the base acutely acuminate and decurrent, the apex narrowed into a short obtuse acumen; primary lateral veins on each side of the midrib 12–20, slender, not crowded, easily distinguishable from the rather conspicuous reticulated secondary venation, their apices forming a distinct vein 2.5–3.5 mm from the margin, with a fainter external one; upper surface of the leaves dark-green, under surface paler, both shining, glandular-punctate.

LUZON, Province of Ilocos Sur, Dolores, *For. Bur. 7123 Klemme:* Province of Rizal, Bosoboso, *Bur. Sci. 6760 Robinson* (type), *Merrill 2806;* Antipolo, *For. Bur. 470 Ahern's collector.* NEGROS, Province of Negros Occidental, Inanayan, *For. Bur. 11197 Everett.* MINDORO, Amnay River, *For. Bur. 11448 Merritt.* (See *E. similis.*)

As shown by the remarkable nature of the calyx, this species closely approaches *E. operculata* Roxb., and especially var. *densiflora* Koord. & Val., of neither which nor of the other varieties have I seen any material. As contrasted with the descriptions by Koorders & Valeton, Wight, and Duthie, it seems to differ by having much smaller inflorescences, smaller flowers, shorter stamens, and the leaf-venation appears to be different.

Except by the young flowers it is almost impossible to distinguish this from *E. similis* Merr.; but the latter has definite calyx-lobes, which often persist beyond the flowering stage, but are more often lost at that time. I know no character to differentiate sterile material of the two species. The name "mala-ruhat na puti," applied to this at Bosoboso, is given to *E. similis* at Lamao.

62. **Eugenia glaucicalyx** Merr. in Bur. Govt. Lab. Publ. (Philip.) 35 (1906) 50.

LUZON, Province of Bataan, Mount Mariveles, *Merrill 3949, For. Bur. 817, 826, 1250, 2748 Borden, For. Bur. 6241, 7359 Curran.* CULION, Halsey Harbor, *Merrill 570, 626.* PALAWAN, Dawara trail, *For. Bur. 7438 Manalo.*

The collections from the latter islands do not quite agree with the type, the submarginal vein being somewhat more distinct, and the branches of the inflorescence shorter. The differences, however, are merely matters of degree, and are not considered to justify specific separation, in the light of present evidence.

It is probable that *For. Bur. 7548 Hutchinson*, from the Island of Dinagat, is also referable here. The collection has mature white fruit, while that of *E. glaucicalyx* is still unknown. The species closely approaches *E. zeylanica* (Linn.) Wight, and may prove inseparable from it.

Local names, *Mareeg*, Bataan; *Calaum*, Culion.

Endemic.

63. **Eugenia paucivenia** sp. nov.

Inflorescentiis terminalibus, paniculato-cymosis, floribus sessilibus vel rarius breviter pedicellatis: calycis tubo turbinato, lobis brevissimis; corolla calyptrata: foliis sessilibus vel subsessilibus, coriaceis, obovatis vel subellipticis, basi breviter auriculatis, margine revolutis, apice rotundatis vel obscure vel brevissime lateque acuminatis; venis utrinque 5–8.

Cymes terminal, 4–6 cm long, trichotomously forked, their branches rather stout, angled and striate; individual flowers white, mostly in triads, sessile or rarely on pedicels not more than 1.5 mm long; very short bracteoles present at the forks of the inflorescence: calyx-tube turbinate, 6.5–8 mm long, extending about 3 mm beyond the ovary, 4 mm wide at the apex; the upper margin forming 4 broadly rounded inconspicuous undulations; corolla calyptrate, but separable into 4 petals about 4 mm in diameter; disk thin; stamens numerous, their filaments about 6 mm long, anthers 0.4 mm long, gland-tipped; style about 1 cm long; ovary with comparatively thick walls, 2-celled, several-ovuled.

A tree 7–8 m high, its trunk about 15 cm in diameter, the branches covered with brownish bark, becoming grayish on the branchlets: leaves sessile or very shortly petioled, the lamina obovate to nearly elliptic in outline, 4.5–7.5 cm long, 22–36 mm wide, the base auriculate or rounded or forming a very short acumen from just before its junction with the petiole, the margin revolute, the apex rounded or obscurely or very broadly and shortly acuminate, the upper surface shining, the under surface dull; primary lateral veins on each side of the midrib 5–7, evident on both surfaces, less often with some of the intermediate veins nearly as prominent, forming a definite submarginal vein with a short loop-like external vein from the extreme base not reaching the middle of the leaf and usually much shorter.

Babuyanes Islands, Camiguin Island, *Bur. Sci. 4118 Fénix*. Luzon, Province of Ilocos Norte, *Cuming 1186* (type).

64. **Eugenia subfalcata** sp. nov.

Inflorescentiis terminalibus, paniculato-cymosis, floribus sessilibus vel breviter pedicellatis; calycis tubo turbinato, apice subintegro; corolla calyptrata: foliis chartaceis, lanceolatis, basi acutis, apice attenuatis, subfalcatis; venis utrinque circiter 30.

Inflorescence terminal, trichotomous, paniculately cymose, nearly 10

cm long, its axes striate and at least the upper more or less angled, the flowers in threes at the apices of its branches, sessile or the terminal on pedicels 1–2 mm long: calyx-tube turbinate, 8–10 mm long, 5 mm wide below the apex, the truncate or subtruncate apex incurved, 3.5 mm wide: corolla before anthesis practically a continuation of the calyx, calyptrate; stamens numerous, the filaments in the young flowers about 4 mm long, the anthers 0.7 mm long; style then less than 5 mm long; ovary 2-celled.

Branches terete, covered with very thin papery smooth brownish-purple (when dry) bark: leaves with petioles 13–15 mm long, the lamina chartaceous, lanceolate, 19–22 cm long, 48–64 mm wide, the base acutely acuminate, the margins strongly revolute, the apex subfalcate, one margin usually nearly straight, incurved on the other, forming a nearly acute acumen 3–5 cm long; primary lateral veins on each side of the midrib when viewed from beneath seem to be about 30, when viewed from above hardly more conspicuous than the intervening ones and seeming to be from 40 to 50; forming a slightly arched intramarginal vein but little within the incurved margins.

Cuming 1049, localized on the sheet as from Albay Province, Luzon, but more likely from Zambales. The species is very distinct from anything else in the collection.

65. **Eugenia claviflora** Roxb. Fl. Ind. 2 (1832) 488.

E. leptantha Wight Ic. (1842) *pl. 528:* Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 105, non Benth. in Hook. Journ. Bot. 2 (1840) 321.

Luzon, Province of Cagayan, Camalaniugan, *For. Bur. 6662 Klemme;* Lalloc, *For. Bur. 18423 Alvarez:* Province of Ilocos Norte, San Quintin, *For. Bur. 7132 Klemme:* Province of Bataan, Mount Mariveles, *For. Bur. 803, 827 Borden, For. Bur. 2646, 2806 Meyer, Whitford 294.*

The Mariveles collections fall under *E. leptantha*, but that has been reduced to a variety of Roxburgh's older species. *For. Bur. 7132* has definitely broader flowers, but is otherwise closely allied, and *For. Bur. 18432* is somewhat intermediate.

Local names, *Gamatulay* (Negrito), *Maramaotan* and *Cusaram* (Cag.), all from Cagayan: *Panglongbuyan-gangoan*, Ilocos: *Carra* and doubtfully *Malaruhat na puti*, Bataan.

Noted as a timber tree in Cagayan: Roxburgh notes this species as a useful timber tree in India.

India to the Malay Peninsula.

66. **Eugenia clementis** sp. nov.

Floribus terminalibus, in umbello composito dispositis, probabiliter cymosis, sessilibus, calycis tubo breviter campanulato basi longiter producto; lobis 4, parvis; petalis 4, parvis; staminibus circiter 30; ovario 2-loculari: foliis oblongo-ellipticis, basi cuneatis decurrentibusque apice acuminatis.

Flowers arranged in a terminal compound umbel, probably cymose, each inflorescence 4–6 cm long, more or less trichotomous, the rachis and its branches 4-angled: individual flowers without pedicels; calyx in all 12–14 mm long, the pseudostalk usually definite, 9.5–12 mm long,

slender, the upper portion of the tube 2.5–3.5 mm long, campanulate, the 4 lobes very short, triangular-ovate, acuminate; petals 4, broadly ovate, about 1.6 mm long, 1.4 mm wide, rounded at the apex, the two inner with processes at the base, separable and apparently falling separately; staminal disk thin; stamens about 30, their filaments 2.5–4 mm long, their anthers orbicular, cordate at the base, 0.3 mm in diameter; style at anthesis 4 mm long; ovary 2-celled, each cell with several ovules.

A tree 8–10 m high, the bark of the ultimate branches covered with grayish bark, often scaling off and leaving the branches purplish; leaves opposite, with petioles 5–9 mm long, the lamina elliptic-lanceolate, 10.5–12 cm long, 3.2–4 cm wide, acute and decurrent at the base, at the apex prolonged into an acumen 1.5–2 cm long; primary lateral veins on each side of the midrib about 50, irregularly forking and anastomosing; submarginal vein thin but sufficiently conspicuous.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1036* (type), *1113*.

67. **Eugenia clavellata** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 104.

LUZON, Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 2747 Borden*, *For. Bur. 2821* Meyer.

Endemic.

68. **Eugenia rosenbluthii** sp. nov.

Cymis terminalibus vel subterminalibus, multifloris, sessilibus in triadibus paniculatim dispositis: calycis tubo tubaeforme, lobis 4 vel 5, minimis; corolla ignota; staminibus brevissimis: foliis subcoriaceis, ellipticis, basi acute acuminatis, apice in acumen angustum obtusum productis; venis utrinque 20 vel pluribus, indistinctis.

Flowers terminal or subterminal, sessile or subsessile in triads, forming a sometimes leafy panicle 5–10 cm long, its rachises slender, quadrangular, 4- or 8-ridged or almost winged: calyx-tube increasing gradually in diameter from the base to just below the apex, where it is moderately expanded, 6–8 mm long, 1.5–2 mm in diameter at the apex, not extending 1 mm beyond the ovary; calyx-lobes 4 or 5, about 0.4 mm long and less than 1 mm wide, deciduous, leaving the margin of the calyx slightly undulate or lacerate; corolla unknown; disk thin, its margin not free; stamens numerous, the longest filaments nearly 1 mm, comparatively stout toward the base, narrowed to a point at the apex, anthers hardly 0.2 mm long; style about 1 mm long, its apex nearly level with that of the calyx; ovary-cavity occupying nearly the entire length of the calyx-tube except the basal 1 mm, 2-celled or apparently often 1-celled.

A tree 10 m high, with a trunk 30 cm in diameter, its terete or nearly terete branches and slender branchlets covered with smooth grayish to cinnamon-colored bark: leaves of a pair sometimes not quite opposite, the petioles 2–4 mm long, the lamina subcoriaceous, elliptic, 4–8 cm long, 15–36 mm wide, acutely acuminate at the base, at the apex forming a narrow obtuse acumen 5–9 mm long, the margins revolute, both surfaces

dull-green or the upper somewhat shining, gland-dotted beneath; primary lateral veins on each side of the midrib 20 or more, thin, and difficult to trace toward the extremes of the leaf, the intramarginal vein best seen from the upper surface as beneath it is concealed or nearly concealed by the revolute leaf-margins.

LEYTE, central divide, *For. Bur. 16890 Rosenbluth* (type); Babatungon, *For. Bur. 12895 Rosenbluth.*

Of Philippine species this is most similar to *E. claviflora,* from which its inflorescence is sufficient to distinguish it: a much nearer ally is *E. attenuata* Miq., from which, judging by the description, it seems to be separated by its rather larger leaves and flowers and the greater extent of its ovary-cavity.

Local name, *Magcusison.*

69. **Eugenia atropunctata** sp. nov.

Inflorescentiis in axillis defoliatis, paniculato-cymosis, floribus in triadibus dispositis, sessilibus, parvis: alabastris subglobosis, calycis lobis 4, brevibus; petalis liberis: foliis chartaceis, oblanceolatis rarius ellipticis vel oblongis, basi acute acuminatis, apice in acumen brevem obtusum angustatis; venis utrinque 12–16.

Inflorescences on the branches below the leaves, 2–5 cm long, solitary or fascicled, trichotomously paniculately branched, the individual flowers mostly in threes, sessile, the bractlets varying from lanceolate to ovate and mucronate and attaining a length of nearly 1 mm: flowers about 2.5 mm long, the buds subglobose or obovoid-globose; calyx-tube about half the total length of the flower, becoming nearly flat after anthesis, turbinate, about 2.3 mm in diameter at the apex, the lobes 4, obtuse, about 0.7 mm long and 1 mm wide at the base, persistent often in early fruit; petals free, suborbicular, 1.6–2 mm long, 2 mm wide; stamens numerous, the filaments 3 mm long, the anthers 0.4 mm long; style 1.5 mm long; ovary 2-celled.

A tree, its branches covered with dark-gray bark, that of the rather slender terete branchlets paler; leaves with petioles 4–12 mm long, the lamina chartaceous, oblanceolate rarely elliptic or oblong, 4–13 cm long, 2–4.2 cm wide, acute or acutely acuminate at the base, decurrent upon the petiole, the margins slightly revolute, at the apex contracted into an obtuse acumen 5–10 mm long, when dry the upper surface usually reddish-brown, the lower surface brown and rather densely dotted with minute black glands; primary lateral veins on each side of the midrib 12–16, exserted on both surfaces and distinct though rather slender, much more conspicuous than the secondary articulations, their extremities forming a definite vein near the margin and a very faint outer vein.

LUZON, Province of Cagayan, *Cuming 1308* (type); Aparri, *For. Bur. 11274 Klemme;* San Vicente, *For. Bur. 17298 Curran.* NEGROS, Province of Negros Occidental, Gimagaan River, *Whitford 1576 Whitford & Everett.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.,* the last specimen having lighter bark and fewer-veined leaves.

Local name, *Pango,* Cagayan.

70. **Eugenia similis** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 106.

Calypthranthes ramiflora Blanco Fl. Filip. (1837) 420, nec *E. ramiflora* Desv. in Ham. Prodr. Pl. Ind. Occid. (1825) 43, nec *E. ramiflora* Miq. in Linnaea 22 (1849) 536.

Syzigium latifolium Blanco Fl. Filip. ed. 2 (1845) 294, nec *S. latifolium* DC. Prodr. 3 (1828) 259, nec *E. latifolia* Aubl. Pl. Guian. (1775) 502, *pl. 199*, nec aliorum.

Eugenia bracteata roxburghii F.-Villar Noviss. App. (1880) 86, quoad synonyma saltem, non Duthie in Hook. f. Fl. Br. Ind. 2 (1879) 502.

Luzon, Province of Bataan, Mount Mariveles, Lamao River, *Whitford 413, For. Bur. 1471 Ahern's collector:* Province of Zambales, *For. Bur. 851 Maule,* Subig, *For. Bur. 5989 Curran.* Mindoro, Maugao, *For. Bur. 9853 Merritt,* the two last specimens with very young flowers.

The following are referable either to this species or to *E. clausa,* they are either sterile or in mature fruit, and I can not distinguish them. Luzon, Province of Nueva Ecija, Cabanatuan, *For. Bur. 8491 Curran:* Province of Zambales, Botolan, *Merrill 2940;* Iba, *Merrill 2994;* Cabangan, *Merrill 3007.* Masbate, *Merrill 3076.* Mindoro, *For. Bur. 8663, 11020 Merritt;* Amnay, *For. Bur. 8847 Merritt.* Mindanao, District of Davao, Samal Island, *For. Bur. 11522 Whitford.*

There seems to be no constant character to separate the leaves of this species from those of *E. clausa:* the specimens other than the respective types cited from Lamao and Bosoboso are fruiting and are placed where they are on geographical grounds alone, as there is nothing to distinguish them except a difference in the shape of the leaves which will not hold for other material. The Bosoboso plants were collected at stations several miles apart. The difference in the calyx is so great that there can be no possible doubt that these species really are distinct.

Otherwise is the case of *E. atropunctata.* The latter is separated at a glance from *E. similis* by the darker bark and leaves, shorter petioles, differently shaped leaves, smaller flowers, free petals, shorter stamens, more persistent obtuse calyx-lobes, and probably longer bracteoles, but it is very much closer to it than this array of characters would seem to indicate.

It seems in every way probable that this is the correct disposition of Blanco's species, above cited, although the reduction is largely a matter of exclusion. Blanco says under this heading that the wood known at San Jose de Batangas under the name of "dinglas" is this species and no other, but he elsewhere ascribes that name in the same locality to a species of *Terminalia,* called by him *Bucida comintana.* Through the kindness of Dr. Leon Guerrero, specimens of "dinglas" were obtained from the presidente of San Jose and proved to be the latter.

Local names, *Paitan,* Zambales; *Malaruhat, Malaruhat na puti,* Bataan.

Endemic.

71. **Eugenia decipiens** Koord. & Val. Bull. Bot. Inst. Buitenz. 2 (1899) 6.

Luzon, Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 1184 Borden, For. Bur. 2781 Meyer.* Both collections, the former sterile, the latter flowering, agree perfectly with the description and with Javan material, except that the leaves are somewhat wider in proportion to their length, especially toward their apices, and are therefore somewhat more abruptly acuminate. They seem entirely too close to warrant specific separation.

Local names, *Malaruhat, Malaruhat na pula.*

Java.

72. **Eugenia jambolana** Lam. Encycl. 3 (1789) 198.

Calyptranthes jambolana Willd. in Usteri Ann. 17 (1796) 23.

Syzygium jambolanum DC. Prodr. 3 (1828) 259.

Eugenia djouat Perr. in Mém. Soc. Linn. Paris 3 (1824) 116.

Myrtus cumini Linn. Sp. Pl. (1753) 471.

LUZON, Province of Cagayan, Linao River, *For. Bur. 18473 Alvarez:* Province of Ilocos Norte, Mount Piao, *For. Bur. 14007 Merritt & Darling:* Province of Abra, Ikmen, *For. Bur. 14553 Darling:* Province of Union, Bauang, *Elmer 5551:* Province of Nueva Ecija, Talavera, *For. Bur. 8470 Curran:* Province of Zambales, Botolan, *Merrill 2914; Cuming 1093:* Province of Pampanga, *Martinez s. n.:* Province of Bulacan, *For. Bur. 12304 Maule:* Province of Rizal, Novaliches, *Loher 2505;* San Mateo, *Merrill Dec. Philip. For. Fl. 109 Ahern's collector;* Bosoboso, *Merrill 1836, For. Bur. 2868 Ahern's collector;* Antipolo, *Merrill 1323, Bur. Sci. 5186, 5187, 5188, 5189, 5190, 5191, 5192, 5193, 5194, 5195, 5196, 5197 Ramos:* Manila, *Marave 140, Ahern 714:* Province of Bataan, Moron, *For. Bur. 6363 Curran;* Lamao River, *Whitford s. n.;* Mariveles, *Ahern 779:* Province of Tayabas, Laguimanoc, *Merrill 2125;* Malicboi, *Richie s. n.* LUBANG, *Merrill 970.* MINDORO, Calapan, *Merrill 2575;* Maugao, *For. Bur. 9857 Merritt.* NEGROS, Rio de Cadiz, *For. Bur. 7300 Everett.* CEBU, Talisay, *For. Bur. 4239 Everett.* GUIMARAS, *For. Bur. 268 Gammill.* PALAWAN, Puerto Princesa, *For. Bur. 3600 Curran, Bur. Sci. 285 Bermejos.*

Universally recognized throughout the islands, either by the name *Duhat* or *Lumboi,* or very slight variants of the latter, the former being especially Tagalog, the other preferred by the other races and the Spaniards.

India to Malaya.

It will probably be possible to avoid changing the specific name, in spite of the fact that Linnæus did have and describe specimens of this species under a name not yet used in the genus. *Myrtus cumini* is based upon his older description in the Flora Zeylanica 185. That (adapted from Richter) is as follows. "Arbor ramis teretibus, cinereis. Folia lanceolata, vel ovato-lanc., oppos., glabra, integerrima, minus acuta, petiolis longiusculis. Corymbi trifidi, compositi, laterales. Arbor zeylanica cuminum redolens Burm. Zeyl. 27. Ankaenda Herm. Zeyl. 23." The identification of the specimens in Hermann's herbarium has been carefully made by Trimen (Journ. Linn. Soc. Bot. 24: 140, 142; Handbook Fl. Ceyl. 1: 216, 2:179), and the confusion by Linnæus and his successors of *Eugenia jambolana* and *Acronychia laurifolia* definitely traced. The specimens of these two species seem to have occupied three folios of Hermann's herbarium, one was entirely *A. laurifolia,* another a mixture of the two, the remaining one was that upon which *Myrtus cumini* was based, *and was entirely E. jambolana.* Had Linnæus adopted any specific name, other than "cumini," not subsequently used, it would be obligatory to take it up by transfer into *Eugenia* in place of *E. jambolana.* The name was obviously borrowed from Burmann, and although the description and specimens belong to *Eugenia,* the name seems to belong with *Acronychia laurifolia,* as is inferentially stated by Duthie under *E. jambolana.* For nomenclatural purposes, then, it seems better to refer both *Myrtus cumini* and *Jambolifera pedunculata* of Linnæus to *Acronychia.* Certainly, changes are necessary in that genus, at least in the specific name. The generic name, is partially protected by the list of nomina conservanda adopted by the Vienna Congress, which excludes two of Adanson's names, but makes no mention of the earlier *Jambolifera* of Linnaeus, concerning which there is no doubt.

73. **Eugenia densinervia** Merr. in Philip. Jour. Sci. 1 (1906) Suppl. 105.

LUZON, Province of Bataan, Mount Mariveles, Lamao River, *Whitford 1249, For. Bur. 719, 813, 1178, 1815, 2921 Borden, For. Bur. 6232 Curran:* Province of Isabela, Baler, *Merrill 1052.*

Endemic.

74. **Eugenia sablanensis** Elmer Leafl. Philip. Bot. 1 (1908) 328.

Proxime E. densinerviae accedens: differt floribus minoribus, 2–3 mm diametro; foliis saepissime admodum minoribus angustioribusque, basi magis cuneatis, apice magis acuminatis.

LUZON, Province of Benguet, Baguio, *Elmer 8879;* Sablan, *Elmer 6197;* Twin Peaks, *Elmer 6459:* Province of Isabela, Cabagan River, *For. Bur. 18562 Alvarez:* Province of Rizal, Bosoboso, *Merrill 1838, Bur. Sci. 2639 Ramos, For. Bur. 3178 Ahern's collector:* Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 6243 Curran:* Province of Isabela, Baler, *Merrill 1080:* Province of Tayabas, Pitogo, *Merrill 2121.* MINDORO, *For. Bur. 9968 Merritt.* NEGROS, Mount Silay, *Whitford 1520.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.* BASILAN, Santa Isabela, *DeVore & Hoover 31.*

This species can only tentatively be held distinct from *E. densinervia,* both being probably too closely related to *E. bracteolata* Wight to be held separate. On the type specimens, the flowers differ distinctly in size, and it is usually possible to estimate the size of the flowers of fruiting material, but it is very difficult to get correlating characters by which sterile specimens or those with immature flowers can be distinguished. The leaves of *E. densinervia* are nearly always slightly longer and wider (especially at the base) than those of *E. sablanensis,* the apex is nearly always rounded, while in the latter species there is nearly always a distinct though short acumen; further the branches of the inflorescence of *E. densinervia* are usually distinctly stouter. Nevertheless, the species nearly or quite intergrade on all these characters. All the collections here referred to *E. densinervia* are unquestionably of that species, several under *E. sablanensis* have immature flowers and are so identified on the faith of the other characters, which are of doubtful validity.

Endemic.

75. **Eugenia incrassata** Elmer Leafl. Philip. Bot. 2 (1909) 581.

Inflorescentiis terminalibus, trichotomo-cymosis, apice subplanis, circiter 1 cm longis, multifloris; floribus breviter pedicellatis, bibracteatis, admodum parvis: calycis tubo turbinato, lobis 4, parvis sed sat conspicuis, rotundatis; petalis calyptratis; staminibus numerosis: foliis petiolatis, subcoriaceis, orbicularibus vel obovato-orbicularibus, basi acute acuminatis decurrentibusque, apice in acumen breve obtusum subito contractis; venis utrinque 18–25, subconfertis, in venam submarginalem coalitis.

LUZON, Province of Tayabas, Lucban, *Elmer 9187.*

Endemic.

76. **Eugenia congesta** Merr. in Bur. Govt. Lab. Publ. (Philip.) 35 (1906) 49.

LUZON, Province of Cagayan, Mount Ababaca, *For. Bur. 17204 Curran:* Province of Lepanto, Mount Data, *For. Bur. 10954 Curran:* Province of Benguet, Mount Tonglon, *For. Bur. 18368 Alvarez, Loher 5101:* Province of Bataan, Mount Mariveles, *Whitford 150, 448, Elmer 6896, For. Bur. 6260 Curran.*

In general the leaves of the northern specimens are longer, actually or proportionally, than those from Mount Mariveles, but they are well linked together by *Whitford 150,* the nomenclatorial type.

Local name, *Batmay,* Benguet.

Endemic.

77. **Eugenia ugoensis** sp. nov.

Affinis *E. congestae:* floribus ignotis: infrutescentibus terminalibus, brevibus, fructibus subglobosis, calycis lobis 4 coronatis: foliis oblongis usque ad obovatis, basi acutis, margine revolutis, apice in acumen breve angustum obtusum angustatis; venis utrinque 25–30, confertis.

Infrutescences terminal, excluding the fruits 1–1.5 cm long, the rachis comparatively stout (about 2 mm in diameter), terete or somewhat quadrangular, not or shortly branched, bearing the scars of many fallen flowers: fruits described as green, yellow, and red, probably indicating stages in maturity, globose or depressed-globose, attaining 1.7 cm diameter, thin-walled, 1-celled, 1-seeded, crowned by 4 somewhat conspicuous calyx-lobes 1.5–2 mm long, with the same range of width, obtuse or rounded at the apex.

A tree 5 m high, with a trunk described as 30 cm in diameter, the somewhat stout branchlets covered with dark-brown or dark-grayish-brown bark: leaves with petioles 1–2.5 mm long, the lamina coriaceous or subcoriaceous, varying from oblong-oblanceolate to obovate, 2.5–4 cm long, 1–2.5 cm wide, the base acute, the margin revolute, at the apex narrowed into a slender obtuse acumen 2.5–8 mm long; primary lateral veins on each side of the midrib 25–30, usually nearly straight but also forking or anastomosing, equally elevated and conspicuous on both surfaces, their apices forming a definite submarginal vein.

LUZON, Province of Benguet, Mount Ugo, at elevations from 1,800 to 2,000 m, *For. Bur. 10913 Curran* (type), *For. Bur. 18030 Merritt, Bur. Sci. 5707 Ramos.*

78. **Eugenia acrophila** sp. nov.

Inflorescentiis terminalibus, brevibus, floribus congestis: calycis tubo turbinato, lobis 4, rotundatis; corolla calyptrata; staminibus admodum paucis; fructibus globosis: foliis coriaceis, parvis, saepius elliptico-lanceolatis, basi acutis, margine revolutis, apice breviter obtuseque acuminatis; venis utrinque 8–12, haud confertis.

Inflorescences terminal, less than 2 cm long, including flowers or fruit, not or hardly prolonged beyond the leaves, the cymes trichotomous, often sessile, the white flowers at the extremities of the short branches, mostly in threes, the forks of the inflorescence with short but broad bractlets: calyx-tube turbinate, about 3.5 mm long, 3.5 mm wide at the base of the lobes; calyx-lobes 4, about 1 mm long, 2 mm wide at the base, rounded at the apex; corolla calyptrate, about 1.5 mm in circumference; stamens few for the genus (about 20), the filaments 2–4 mm long, the suborbicular anthers 0.4 mm in diameter; style 3 mm long, subulate; ovary 2-celled: fruit globose, less than 1 cm in diameter, thick-walled, 2-celled.

A tree attaining a height of 9 m and a trunk-diameter of 30 cm, the branchlets often roughened by the scars of fallen leaves, covered with pinkish-gray or brownish bark: leaves with petioles 1–3 mm long, the

lamina coriaceous, shining on both surfaces but paler beneath, ranging in outline from elliptic-lanceolate to oval or obovate, 12–25 mm long, 8–15 mm wide, the base acute, the margin revolute, the apex contracted into a short obtuse acumen; primary lateral veins on each side of the midrib 8–12, widely separated considering the shortness of the leaf, minor reticulations few but comparatively conspicuous, all somewhat coarse, a definite vein present just within the margin.

Luzon, Province of Benguet, Mount Pulog, *For. Bur. 18068* (type), *18036 Curran Merritt & Zschokke:* Province of Zambales, Mount Tapulao, *For. Bur. 8066, 8088 Curran & Merritt,* at elevations from over 2,000 to 2,700 m, the young leaves noted as giving a reddish-brown color to the forest.

Local name, *Baltic,* Benguet.

79. **Eugenia alvarezii** sp. nov.

Inflorescentiis terminalibus et subterminalibus, brevibus, trichotomis, floribus in ramulorum apicibis confertis: calycis tubo turbinato-hemispherico, lobis 4, brevibus; petalis liberis; staminibus multis: foliis coriaceis, supra praesertim nitidis, ellipticis, elliptico-lanceolatis vel oblongis, basi acutis, margine lente revolutis, apice anguste acuminatis; venis utrinque 10–15, haud confertis.

Inflorescences terminal and subterminal, about 2 cm long, forming a leafy panicle, the sessile white flowers all crowded at the extremities of the main branches: calyx-tube turbinate-hemispheric, 4 mm long, 4 mm wide at the apex, the lobes very short, merely forming an undulate border; petals 4, free, orbicular-ovate, 2.5–3 mm long; stamens numerous, the filaments about 3 mm long, the anthers 0.5 mm long; style subulate, 4 mm long, ovary somewhat thick-walled, 2-celled, several-seeded: fruit reddish, slightly exceeding 1 cm in diameter, thick-walled, 2-celled, the seeds immature.

A tree 20 m high, with a trunk 40 cm in diameter, the branches covered with cinnamon-colored bark: leaves with petioles 3–6 mm long, the lamina coriaceous, the upper surface vitreous-shining, the under somewhat shining but much less so than the upper, elliptic, elliptic-lanceolate, or oblong, 4.5–6 cm long, 2–3 cm wide, the base acute, the margins slightly revolute, the apex rather gradually contracted into a slender acumen not exceeding 1 cm long; primary lateral veins on each side of the midrib 10–15, not at all crowded, raised on both surfaces, their apices forming a submarginal vein as definite as themselves, a faint vein on the extreme margin.

Luzon, Province of Benguet, Sapuan, *For. Bur. 18353 Alvarez* (type, flowering); Pauai, *For. Bur. 18379 Alvarez* (fruit).

Local name, *Balteak.*

80. **Eugenia roseomarginata** sp. nov.

Inflorescentiis terminalibus vel subterminalibus, floribus sessilibus, in 4–8-floris capitulis congestis: calycis tubo turbinato, margine undulato; corolla calyptrata: foliis coriaceis, ovatis usque ad oblongis, basi acutis, apice acuminatis; margine rosea; venis utrinque circiter 20.

Inflorescences terminal or subterminal, 1–2 cm long, the rachises subterete, striate, the bractlets ovate, obtuse, 0.5 mm long, the flowers sessile in heads of 4 to 8, paniculately disposed: buds 3.5–4 mm long; calyx-tube turbinate, 2.5 mm long, 2 mm wide at the apex, the lobes merely forming undulations less than 0.5 mm long, ridge running down the side of the tube corresponding to their most elevated point; corolla calyptrate, 2 mm in diameter; stamens numerous, the filaments not exceeding 2 mm in length, the anthers oblong, 0.3 mm long; style as yet only 1 mm long; ovary somewhat thick-walled, 2-celled, few-ovuled.

A tree attaining a height of 5 m and a trunk-diameter of 20 cm, its branches covered with gray to pinkish-gray bark: leaves with petioles 3–5 mm long, the lamina coriaceous, ovate, oblong, or more usually lanceolate or elliptic-lanceolate, 3.5–8 cm long, 1.8–3.2 cm wide, the base acute or acutely acuminate, usually decurrent, the margin not or barely revolute, the apex obtusely acuminate or caudate, at least the upper surface shining; primary lateral veins on each side of the midrib 18–25, usually much more conspicuous than the intervening irregularly-reticulated intervening veins, their apices forming a vein close to the margin, in the intervening space on the upper surface pinkish like the under surface and not showing any veins.

LUZON, Province of Ilocos Norte, Mount Piao, *For. Bur. 13975* (type), *13990 Merritt & Darling:* Province of Ilocos Sur, Mount Bulagao, *For. Bur. 14054 Merritt & Darling.*

This species approaches *E. striatula,* but the latter is easily distinguished not only by its widely branching inflorescence and free petals, but by its fewer leaf-veins.

Local name, *Pamayausin*, Ilocos Norte.

81. **Eugenia perpallida** Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 106.

Syzygium pallidum Merr. in Bur. Govt. Lab. Publ. (Philip.) **17** (1904) 38; non *Eugenia pallida* Berg. in Mart. Fl. Bras. **14**:[1] 231.

LUZON, Province of Isabela, Baler, *Merrill 1043:* Province of Pangasinan, near Eguia, *For. Bur. 8284 Curran & Merritt:* Province of Zambales, Subig, *Merrill 1764, For. Bur. 378, 904 Maule;* Selangan, *For. Bur. 5924 Curran;* Cauag, *For. Bur. 6019 Aguilar;* Mount Tapulao, *For. Bur. 8258 Curran & Merritt:* Province of Bataan, Mount Mariveles, *Whitford 1209, For. Bur. 3124 Meyer;* Limay, *Bur. Sci. 6192 Robinson:* Province of Batangas, *For. Bur. 7689 Curran:* Province of Albay, Manito, *For. Bur. 10570 Curran.* LUBANG, *For. Bur. 12238 Rosenbluth.* NEGROS, Province of Negros Occidental, Gimagaan River, *Whitford 1587* (closely allied, but probably distinct); Mount Silay, *Whitford 1526.*

Local names, *Malaruhat na pula, Payetan,* Pangasinan; *Arinaya, Bignay-maching, Pielan, Malaruhat na puti,* Zambales; *Bulog,* Negros.

Endemic.

82. **Eugenia parva** comb. nov.

E. acuminatissima parva Merr. in Philip. Journ. Sci. **1** (1906) Suppl. 104.

LUZON, Province of Ilocos Norte, Mount Piao, *For. Bur. 13980, 13981 Merritt & Darling:* Province of Ilocos Sur, Mount Bulagao, *For. Bur. 14029 Merritt & Darling:* Province of Zambales, Candelaria, *For. Bur. 8247 Curran & Merritt:* Province of Pangasinan, northwest of Baui, *For. Bur. 8359 Curran & Merritt:* Province of Bataan, Mount Mariveles, *Whitford 1136, 1218:* Province of Camarines, near Lagonoy, *For. Bur. 10646 Curran:* Province of Albay, *Cuming 861.*

Bohol, *Cuming 1825.* Palawan, Panacan Point, *For. Bur. 3834 Curran;* Mount Victoria, *Bur. Sci. 730, 751 Foxworthy.*

This species seems well distinct from *E. acuminatissima* by its essentially different venation; it is closely allied to *E. perpallida*, from which it is most easily separated by the characters indicated in the key. The Palawan collections have in general larger and wider leaves than the type, attaining 85 by 32 mm, but they seem to intergrade well with the most typical material. *For. Bur. 8359* is atypic, having leaves hardly at all acuminate.

Local names, *Panomanagan*, Ilocos Norte; *Ambabacit*, Ilocos Sur.

Endemic.

83. **Eugenia saligna** comb. nov.

Jambosa saligna Miq. Fl. Ind. Bat. 1[1] (1855) 432.

E. acuminatissima Kurz in Journ. As. Soc. Bengal 46[2] (1877) 67, nec Miq. in Linnaea 19 (1847) 440, nec Berg in Mart. Fl. Bras. 14[1] (1857) 315.

Jambosa acuminatissima Hassk. Cat. Hort. Bog. Alt. (1844) 362.

Myrtus acuminatissima Blume Bijdr. (1826) 1088.

Syzygium acuminatissimum DC. Prodr. 3 (1828) 261.

E. cumingiana Vidal Phan. Cuming. Philip. (1885) 173, non *E. cumingii* Hook. & Arn. in Hook. Bot. Misc. 3 (1833) 319.

Syzygium subdecurrens Miq. Fl. Ind. Bat. 1[1] (1855) 449.

Luzon, Province of Isabela, Baler, *Merrill 1064:* Province of Benguet, Mount Tonglon, *For. Bur. 5044 Curran:* Province of Zambales, Mount Tapulao, *For. Bur. 8104, 8105 Curran & Merritt, Bur. Sci. 4764, 5096 Ramos;* Candelaria, *For. Bur. 8248 Curran & Merritt:* Province of Bataan, Mount Mariveles, *Whitford 1198, 1228, For. Bur. 811, 2385 Borden, For. Bur. 2406, 2628, 2801, 2807, 3004 Meyer, For. Bur. 6248, 6269 Curran:* Province of Rizal, Antipolo, *For. Bur. 432, 475 Ahern's collector;* Bosoboso, *Bur. Sci. 1494 Ramos, For. Bur. 2896 Ahern's collector;* Mount Dugo, *Loher 2501:* Province of Tayabas, Pagbilao, *Merrill 1930:* Province of Albay, *Cuming 925;* Batan, *For. Bur. 15001 Aldor.* Marinduque, Boac, *For. Bur. 12153 Rosenbluth.* Negros, Province of Negros Occidental, Mount Silay, *Whitford 1544;* Cadiz, *For. Bur. 5571 Everett.* Leyte, Ormoc, *For. Bur. 12725 Rosenbluth.* Mindanao, Province of Misamis, Mount Malindang, *For. Bur. 4771 Mearns & Hutchinson:* Lake Lanao, Camp Keithley, *Mrs. Clemens 730, s. n.*

This includes three more or less intergrading series, the first well represented by the type of *E. cumingiana*, a second formed by the collections from Benguet, Zambales, Tayabas, and *For. Bur. 1494*, from Rizal, distinguished by having the under surface of the leaves very conspicuously glandular; while *For. Bur. 432*, from Rizal, and some of the Lanao specimens have much wider leaves, often showing two submarginal veins. There seems to be no sufficient reason for separating them specifically.

The Philippine material has been compared with Javan specimens, taken from trees in cultivation at Buitenzorg, and with a sheet from the Andaman Islands, *Dr. Prain's collector 85*, a duplicate from the Botanic Gardens at Calcutta, all distributed as *E. acuminatissima* Kurz, and there can be no doubt that Merrill's reduction of *E. cumingiana* is correct. But the former name had already been used in *Eugenia* for two other species, though one does not belong to this genus: the other is apparently valid. It has been necessary, in consequence, to accept Miquel's specific name as the oldest tenable one, the synonymy being taken from Koorders and Valeton.

Local names, *Malaruhat, Cahoybod*, Bataan; *Bujucan*, Albay; *Taguilumboy*, Negros; *Binloan*, Leyte; the Zambales form is there called *Cuyagin* and *Malaruhatsapa.*

India to southern China, Malaya and tropical Australia.

84. **Eugenia astronioides** sp. nov.

Inflorescentiis paniculato-cymosis, floribus sessilibus, saepissime in triadibus dispositis; parvis: calyces tubo turbinato, lobis 4, brevibus, rotundatis; corolla calyptrata; staminibus numerosis; ovario biloculari: foliis chartaceis, oblongis vel elliptico-lanceolatis, basi acutis, apice anguste acuminatis; venis utrinque circiter 12, laterale ab margine remota.

Inflorescences terminal, the individual flowers in triads, or beneath the apex sometimes single, the triads forming lax panicles 2–4 cm long, the sessile flowers subtended by a pair of ovate obtuse fleshy bracteoles 0.5 mm long: calyx-tube turbinate, terete or distinctly angled, 2–2.5 mm long, 1.5–2 mm wide just below the apex, the apex often slightly incurved; calyx-lobes 4, about 0.3 mm long, rounded; corolla calyptrate, about 1.5 mm in diameter; staminal-disk not projecting; stamens numerous, the filaments 1–2 mm long, the anthers 0.3–0.4 mm long; style 1.5 mm long; ovary 2-celled, few-ovuled.

A tree or shrub, attaining a height of 10 m, and a trunk-diameter of 30 cm, its terete branches covered with gray or pinkish-gray bark: leaves with petioles 1–4 mm long, the lamina chartaceous or submembranaceous, oblong, oblong-lanceolate or elliptic-lanceolate, 6–12 cm long, 1.5–3 cm wide, the base acute and decurrent, the margin somewhat revolute, the apex gradually narrowed and forming a slender obtuse or subacute acumen 1–1.5 cm long; primary lateral veins on each side of the midrib 10–13, slender, much more conspicuous on the under surface, the intervening veins only rarely prominent, the apices forming a lateral vein usually one-fourth of the distance from the margin to the midrib.

LUZON, Province of Cagayan, growing at elevations of 150–300 m above the sea, *For. Bur. 18457, 18467* (type) *Alvarez;* Missiones River, *For. Bur. 17194 Curran.* All specimens were collected on March 3, 1909, and the flowers, described as green and odorless, but pinkish when dry, are slightly immature. It is very distinct from any other Philippine species, the leaves resembling those of *E. mananquil,* which is not at all closely allied, and the whole aspect of the plant, as seen on a herbarium sheet, suggesting rather indistinctly *Astronia cumingiana.*

Local names, *Sudsod, Guisgues.*

85. **Eugenia costulata** sp. nov.

E. cinnamomea Merr. in Philip. Jour. Sci. 1 (1906) Suppl. 104, pro parte, non Vidal Phan. Cuming. Philip. (1886) 173.

Inflorescentiis terminalibus vel subterminalibus, divaricato-cymosis, floribus sessilibus: calyce turbinato, lobis parvis, calyce fructibusque saepe etiam corolla 4-costatis: foliis petiolatis, ellipticis vel lanceolato-ellipticis, basi acutis, apice acuminatis; venis utrinque 8–12.

Cymes terminal or in the axils of the upper leaves, 4–10 cm long, forking trichotomously, often at the base, all of its branches slender at anthesis, thickened in fruit, acutely 4-angled, the individual flowers usually in threes, sessile, a pair of ovate obtuse bracteoles 0.5 mm long subtending the forks of the inflorescence and the flowers: buds about 5.5 mm long, flowers attaining at least 1 cm in length; calyx 4.5–5 mm long,

2.5–4 mm wide at the apex, extending 2.5–3 mm beyond the ovary, the 4 rounded lobes inconspicuous, unequal, all less than 0.5 mm long, a conspicuous rib running from the apex of each lobe downward to the base of the flower and often continued upward upon the corolla; corolla white, calyptrate, about 1 mm in vertical height; staminal disk usually very thin; stamens numerous, the filaments 4–6 mm long, the anthers 0.3 mm long; styles 2–3.5 mm long, acicular, hidden by the stamens and rarely reaching the level of the margin of the calyx; ovary 2-celled, with numerous small ovules; fruit brown, ellipsoid, the largest about 2 cm long and 1 cm in diameter, round in transverse section but conspicuously 4-angled, 1-celled, 1-seeded.

A tree 8–22 m high, its trunk 24–75 cm in diameter, the terete branchlets covered with grayish or cinnamon-gray bark: leaves with petioles 3–6 mm long, the chartaceous lamina elliptic or elliptic-lanceolate, 5–14.5 cm long, 2.8–5.5 cm wide, the base acute and decurrent, the apex contracted into an obtuse acumen ranging in length from 5 to 30 mm both surfaces brown but the under the paler; primary lateral veins on each side of the midrib 8–12, quite distinct but not prominent, sometimes rather more numerous by the development of other veins; the main submarginal vein usually originating from the third lowest of the lateral veins and in the middle of the leaf about 2.5–5 mm from the margin, the second lowest lateral vein originating a less distinct vein nearer the margin, the lowest very faint; secondary veins frequent and frequently anastomosing.

Luzon, Province of Rizal, Antipolo, *For. Bur. 412 Ahern's collector* (type); Bosoboso, *For. Bur. 2150 Ahern's collector:* Province of Bataan, Mount Mariveles, Lamao River, *For. Bur. 814, 1188 Borden, Whitford 344:* Province of Tayabas, Atimonan, *Whitford 673.* Only the first of these numbers bears flowers, the others with one exception are in fruit, but match well. Other very similar fruiting material for the same localities has no ribs upon the fruit. Further, the leaves of this species are an excellent match for those of the type of *E. cinnamomea*, but the flowers are very different.

86. **Eugenia benthamii** A. Gray Bot. Wilkes U. S. Expl. Exped. (1854) 520, non *E. benthamii* Berg in Linnaea **27** (1856) 164.

Syzygium nitidum Benth. in Hook. Lond. Jour. Bot. **2** (1843) 221, nec *Eugenia nitida* Vell. Fl. Flum. (1790) 208, nec Benth., nec Cambess., nec Duthie.

Luzon, Province of Bulacan, Angat, *For. Bur. 7449 Curran:* Province of Rizal, Antipolo, *For. Bur. 433 Ahern's collector:* Province of Bataan, Mount Mariveles, *For. Bur. 2803 Meyer:* Province of Tayabas, Pagbilao, *Merrill 1981:* Province of Camarines, Libmanan, *For. Bur. 895 VanWickle;* Pasacao, *For. Bur. 703 VanWickle, For. Bur. 15792 Rosenbluth.* Mindoro, Abonabon, *Merrill 2185;* Pola, *Merrill 2237.* Mangsi Islands, *Wilkes Expl. Exped. s. n.* Two collections, in fruit, undoubtedly cospecific with one another (*Elmer 6130,* Sablan, Benguet, and *For. Bur. 423 Ahern's collector,* Antipolo, Rizal), may possibly belong here, but have a much more definite submarginal vein.

A note on the nomenclature is necessary. *E. benthamii* was based by Gray on Bentham's species, with the citation of the Philippine specimen, and other notes. A fragment of the Mangsi specimen is in this herbarium, and so far as

possible agrees with the specimens here cited, and is noted by Merrill [11] as also agreeing with Bentham's type from Tobie Island. For some reason, *E. benthamii* A. Gray is not listed in the Kew Index, but a species of that name is credited to Berg as in Linnaea **27** (1854) 164, and other species of that author in the same paper are uniformly so dated. No direct evidence is available here to determine the question, but the indirect evidence seems to indicate that Gray's name has priority by at least 18 months. In Hooker's Journal of Botany & Kew Garden Miscellany **6** (1854) 285–287, there is a review of Gray's publication. A simple calculation shows that this was the September number. From the tone of the article, it is probable that the volume was reviewed promptly upon receipt; from the statements that "the plates are not yet published," and "some of the unpublished plates are in our possession," it is probable that no other delays than those of transit retarded its receipt: further, the reference to the death of Wallich in the June number, page 185, "The pages of our Journal were already printed, last month, when we received the melancholy tidings of the death [in London] * * * on the 28th of April" would indicate that the numbers were appearing promptly, whether this refers to the number for April or for May. This, more definitely than any other information we have yet received, would indicate that Gray's volume appeared about July, 1854. On the other hand, a review of the various articles in Linnaea, in the Botanische Zeitung **15** (9 Ja 1857) 27, places volume 27 of that magazine, with Berg's article specifically mentioned, in the year 1856. In the Botanische Zeitung **13** (7 D 1855) 869–871, a review of the 26th volume of Linnaea appears, written like the other by von Schlechtendal, editor of Linnaea and coeditor of the Botanische Zetiung. In this, it is stated that the first part of volume 27 had already appeared, and that it would at once be followed by the others, the latter to contain Berg's article on the *Myrtaceae* of South America, Brazil excepted.

Local names, *Anubing*, Tayabas; *Arahan*, *Macaasim*, *Malaruhat*, Camarines, the last also in Mindoro.

87. **Eugenia grisea** sp. nov.

Jambosa lineata Merr. in For. Bur. Bull. (Philip.) **1** (1903) 43, pro parte, non aliorum.

Inflorescentiis cymosis, terminalibus vel subterminalibus; floribus parvis, calycis tubo subturbinato, basi producto, apice brevissime lobato, corolla calyptrata, staminibus numerosis; baccis depresso-globosis: foliis ellipticis vel elliptico-oblanceolatis, utrinque acuminatis, nitidis, subcoriaceis; venis utrinque 20–25, teneris.

Inflorescences terminal or in the axils of the upper leaves, 4–7 cm long, usually trichotomously forked, the flowers mostly densely crowded at or near the apices of the branches, the terminal clusters 3–9-flowered, bracteoles very small or wanting: individual flowers in all about 5 mm long, the basal 1–2 mm of which forms a pseudostalk; calyx in all about 4 mm long, about 2.5 mm in diameter at the apex, extending 1.5 mm beyond the ovary; calyx-lobes not attaining 0.5 mm, rounded, inconspicuous; corolla calyptrate, about 2 mm in diameter at the base, with a vertical height of about 0.5 mm; staminal disk present but small; stamens numerous, the filaments mostly 2–2.5 mm long, the anthers about 0.5 mm long, comparatively large; style about 3 mm long; the thin-walled

[11] This Journal **3** (1908) Bot. 83.

ovary 2-celled, with several ovules: fruit brown, depressed-globose, 15 mm long, 17–18 mm wide, crowned by the truncate neck-like free part of the calyx, 1-celled, rarely 2-celled, each cell containing a single seed 1 cm in diameter.

A tree attaining at least a height of 8 m and a trunk-diameter of 30 cm, the bark scaly, yellowish, that of the terete or nearly terete ultimate branches gray or somewhat pinkish-gray: leaves with petioles 6–14 mm long, the lamina hardly more than chartaceous though by the eye alone it would be considered coriaceous, elliptic or elliptic-oblanceolate, 6.5–13 cm long, 3–5.5 cm wide, the base acuminate and decurrent on the petiole, the apex contracted into an obtuse acumen 5–10 mm long, the upper surface of the lamina olivaceous and shining, the lower surface paler and duller; primary lateral veins on each side of the midrib 20–25, usually difficult to count accurately owing to intervening veins of nearly equal prominence and to irregular anastomoses, all of the veins thin and of nearly equal prominence on both surfaces, forming a definite vein about 2 mm from the margin.

LUZON, Province of Cagayan, San Vicente, *For. Bur. 4290 Klemme:* Province of Rizal, Bosoboso, *For. Bur. 2862* (type), *3254 Ahern's collector*, *Merrill 1821.* GUIMARAS, Nagaba, *For. Bur. 303 Gammill.* TINAGO, *Ahern 429, 443.* MINDANAO, District Province of Surigao, Surigao, *Ahern 516.*

A species apparently very closely related to *Eugenia jamboloides* Koord. & Val., differing most notably in the venation of the leaves.

Local names, *Bansalaguin*, Rizal; *Butadtad*, Guimaras; *Lagilagi*, Dinagat and Surigao; *Canomay*, Tinago.

88. **Eugenia mimica** Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 212.

Two rather dissimilar series are represented by the plants here considered to belong to this species. That agreeing with the nomenclatorial type has leaves usually more than four times as long as wide, 23–85 mm long, 7–22 mm wide, and their apex is comparatively broadly acuminate or merely obtuse; the other series has thinner, larger, comparatively wider leaves, 7–14 cm long, 2–6.5 cm wide. In spite of this great range in leaf-outline, which is from linear-oblanceolate to suborbicular, the transition from the one extreme to the other passes through such gradual stages that it seems obligatory to include them all within the limits of the one species. It is not unlikely that these forms represent ecologic types, the first inhabiting river margins, the latter growing on ridges, cliffs, or in open forest.

Form 1. Leaves narrow. *E. mimica* proper.

LUZON, Province of Pangasinan, *Cuming 958:* Province of Bulacan, Angat, *For. Bur. 11144, 11158 Aguilar;* Norzagaray, *Yoder 199*, *For. Bur. 7168 Curran:* Province of Rizal, *For. Bur. 3431 Ahern's collector;* Montalban, *Merrill 5034;* Bosoboso, *Bur. Sci. 1438 Ramos.* MINDORO, Iriron, *For. Bur. 8849 Merritt.*

Form 2. Leaves wider.

LUZON, Province of Pampanga, Linga River, *For. Bur. 5781 Curran:* Province of Zambales, Bagaac, *For. Bur. 386 Maule:* Province of Bataan, Lamao River, *Williams 381:* Province of Bulacan, Angat, *For. Bur. 11256 Klemme:* Province of Rizal, Antipolo, *For. Bur. 410 Ahern's collector:* Province of Tayabas, *For. Bur. 10331 Curran:* Province of Camarines, Pasacao, *Ahern 56, 77.* MINDORO, *Cuming 1498;*

Iriron, *For. Bur. 8827 Merritt.* MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9167, 9399 Whitford & Hutchinson.*

For. Bur. 7168, Cuming 958, For. Bur. 11256, For. Bur. 8827, in the order named, form an almost perfect transition series.

Local names, *Malalumbay,* Zambales; *Macaasin,* Tayabas and Camarines; *Maladuhat,* Camarines; *Bansalagun,* Mindoro.

Endemic.

89. **Eugenia striatula** sp. nov.

Inflorescentiis terminalibus vel lateralibus, cymosis, multifloris, calycis tubo turbinato, fere truncato, petalis liberis: foliis coriaceis, apice breviter lateque acuminatis, basi acutis, venis utrinque 12–20.

Cymes widely branching, terminal, axillary, or below the leaves, 6–12 cm long, trichotomous, the flowers mostly in threes, sessile or the middle one very short-pedicelled, occasionally single and then appearing pedicelled, bracteoles ovate, very short, the branches of the inflorescence mostly 4-angled with fine longitudinal striae which are more conspicuous throughout the length of the calyx: calyx-tube subtruncate, 7–8 mm long, extending about 3 mm beyond the ovary, about 4.5 mm in diameter at the apex, turbinate or nearly obconic, becoming a pseudostalk at the base; calyx-lobes every short, rounded, inconspicuous; petals 4, white, free, suborbicular, 4 mm in diameter; stamens numerous, the filaments about 1 cm long, the anthers 0.4 mm long, tipped by a somewhat conspicuous gland; style 7 mm long; ovary 2-celled with numerous ovules: fruit blue-black, edible, ovoid, 1 cm long, 7 mm in diameter, 1-celled, or at the apex with a rudiment of the second cell, 1-seeded.

A tree 8 m high, with a trunk attaining 25 cm in diameter, the terete or nearly terete branches covered with gray bark: leaves with petioles 3–6 mm long, the lamina coriaceous, ranging in outline from elliptic-lanceolate to obovate, 4–12 cm long, 18–55 mm wide, the upper surface nearly olivaceous, the under surface paler, at the apex forming a short obtuse acumen, the base acute and decurrent upon the petiole; primary lateral veins on each side of the midrib 12–20, usually with a strong intervening vein, the anastomoses quite irregular, with a very definite vein about 1–3 mm from the margin, the margin with faint veins only, or these hardly evident.

LUZON, Province of Zambales (probably), *Cuming 1046* (type); Rio Baquiling, *For. Bur. 6953, 6982 Curran;* San Juan, *For. Bur. 8235 Curran & Merritt:* Province of Rizal, Bosoboso, *For. Bur. 2143 Ahern's collector.* The locality ascribed to Cuming's specimen on the sheet itself is Albay Province, but the numbers from that province run from 834 to 947, while the localities for those between 1,040 and 1,112, both inclusive, are not definitely known. Occasional sheets, none so far as I have seen within these limits, are localized as Zambales, so it is nearly certain that Cuming collected in that province; the series ending in 1,039 was from Pangasinan, and that beginning with 1,113 from Ilocos Sur. It would thus be extremely probable that the Zambales series, not otherwise accounted for, embraced the intervening numbers, and the present species is evidence in favor of that view.

90. **Eugenia robinsonii** Elmer Leafl. Philip. Bot. (1909) 583.

Inflorescentiis terminalibus vel subterminalibus, paniculato-corymbosis, rhachide ramisque admodum crassis, ramulis ultimis brevissimis, 1–4 (saepissime 3) flores sessiles gerentibus: calycis tubo turbinato, truncato vel brevissime 4-lobato; petalis 4, liberis; staminibus numerosis. Arbor, foliis mediocriter petiolatis, chartaceis, ellipticis vel oblongis, basi acute acuminatis decurrentibusque, apice anguste acuminatis; venis utrinque 15–20.

NEGROS, Province of Negros Oriental, Dumaguete, Cuernos Mountains, *Elmer 10050*.

This closely approaches *E. benthamii*, and may ultimately prove to be connected; at present, it seems to be well separated from typical specimens of that species by its much closer venation, but certain intermediates bring the two very near one another.

91. **Eugenia brittoniana** sp. nov.

Inflorescentiis terminalibus vel subterminalibus, floribus saepissime sessilibus in triadibus vel sub apice solitariis et breviter pedicellatis, racemose vel paniculatim dispositis, calycis tubo turbinato, margine superiore undulato vel truncato; corolla calyptrata: foliis coriaceis, ellipticis vel oblongis, basi acute acuminatis, apice acuminatis; venis utrinque 10–12.

Inflorescences terminal and in the upper axils, the outline of the peduncles and the apices of the flowers nearly a square; the white flowers at the tips of the quadrangular branches sessile in threes, below the apices often solitary and shortly pedicelled, individual inflorescences 2.5–4 cm long, broad but very short bracteoles present at the articulations: calyx-tube turbinate, 4–5 mm long, 4–5 mm in diameter at the apex and 1–1.5 mm at the base, extending 3 mm beyond the ovary; its apex forming shallow undulations or truncate; corolla calyptrate; stamens numerous, the filaments 4–6 mm long, the anthers 0.3 mm long: style 7 mm long; ovary thick-walled, 2-celled, few-ovuled.

A tree attaining a height of 10 m with a trunk-diameter of 15 cm, its branches covered with gray or mottled gray and dark-brown bark: leaves with petioles 5–8 mm long, the lamina coriaceous, elliptic, oblong, or nearly oval, 4.5–8 cm long, 2–4 cm wide, the base acutely acuminate and somewhat decurrent, the margin slightly recurved, the apex forming an obtuse acumen 5–10 mm long; primary lateral veins on each side of the midrib 10–12, purplish, the intervening veins few but fairly conspicuous, submarginal vein definite but often irregular, when irregular the submarginal vein of the basal half of the leaf continuing beyond that point as a faint outer vein, but sending a stronger reticulation to a vein formed by the third or fourth lateral vein which is the true submarginal vein in the upper half of the leaf.

LUZON, Province of Benguet, Baguio, *Williams 1461, 1464* (type). Named for Dr. N. L. Britton, of the N. Y. Botanical Garden, under whose direction Mr. Williams's trip was undertaken and the writer began his study of Philippine botany.

92. **Eugenia mindorensis** sp. nov.

Inflorescentiis terminalibus vel subterminalibus, floribus sessilibus in triadibus racemose dispositis: calycis tubo turbinato, margine superiore undulato; corolla calyptrata: foliis coriaceis, ellipticis vel elliptico-lanceolatis, basi acutis, apice acuminatis; venis utrinque 15–18, concoloribus.

Inflorescences terminal or in the upper axils, the axes rather stout, terete, 2.5–5 cm long, the flowers in threes, white with an odor resembling that of dandelions, sessile or on extremely short pedicels, the triads racemosely arranged: calyx-tube turbinate, 7 mm long, 2 mm in diameter at the apex and nearly 2 mm at the base, extending 4 mm beyond the ovary, its upper margin forming shallow undulations rather than lobes; corolla calyptrate; stamens numerous, the filaments 1–1.3 cm long, the anthers 0.5 mm long; style about 1 cm long; ovary thick-walled, 2-celled, several-ovuled.

A tree attaining a height of 18 m and a trunk-diameter of 30 cm, its terete branches covered with gray or cinnamon-gray bark: leaves with petioles 8–12 mm long, the lamina coriaceous, elliptic or elliptic-lanceolate, 5–10 cm long, 2.5–4.5 cm wide, the base acutely acuminate and decurrent, the margin barely revolute, the apex gradually contracted and forming an obtuse or subacute acumen about 1 cm long; primary lateral veins on each side of the midrib 15–18, thin but distinct on the lower surface, usually less distinct on the upper, somewhat irregularly forking and anastomosing, slightly paler than the mesophyll, their apices forming a definite vein about 1 mm within the margin.

MINDORO, Yling Island, *For. Bur. 9820 Merritt* (type); Igsoso, *For. Bur. 8661 Merritt.*

Local name, *Malaruhat.*

93. **Eugenia garciae** Merr. in Bur. Govt. Lab. Publ. (Philip.) **17** (1904) 36, as syn.

Jambosa garciae Merr. loc. cit.

MINDORO, Pola, *Merrill 2367.* MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 471.*

Local name, *Lipote,* Mindoro.

Endemic.

94. **Eugenia polycephaloides** sp. nov.

Inflorescentiis ramifloris, divaricato-cymosis; calycis tubo turbinato, lobis 4; petalis liberis vel fere calyptratis, 4, albis; staminibus numerosis: foliis breviter petiolatis vel subsessilibus, oblanceolatis vel ellipticis, mediocris, admodum coriaceis, basi acuminatis, lente cordatis, apice obtuse acuminatis; venis utrinque 14–18.

Inflorescences borne on the branches below the leaves, dichotomously and trichotomously cymose, usually widely divaricate, 5–10 cm long, 7–13 cm wide, common peduncle 1 cm long or shorter or none; bracts similar to the bracteoles; flowers usually in threes, the individual ones sessile, subtended by two decussate pairs of ovate or suborbicular bracteoles 2–3 mm long: calyx-tube turbinate, 5–5.5 mm long, 4–5 mm wide at the base

of the lobes, projecting about 3 mm beyond the ovary; calyx-lobes 4, rounded, 1–1.5 mm long, 2–3.5 mm wide; petals free or apparently sometimes calyptrate, white, suborbicular, 5 mm in diameter; disk evident; stamens numerous, the filaments 7–14 mm long, the anthers about 0.5 mm long; style slightly exceeding 1 cm in length; ovary 2-celled.

A tree 15–20 m high, with a trunk 50–75 cm in diameter, the branches and branchlets 4-angled and sometimes slightly winged, with gray or purplish bark: leaves with petioles about 5 mm long, or less often subsessile, the lamina subcoriaceous, oblanceolate or elliptic, 6–20 cm long, 4–7.5 cm wide, the base acuminate and shallowly cordate, the apex somewhat abruptly contracted into a short obtuse acumen; lateral veins on each side of the midrib 14–18, forming a definite submarginal vein.

LUZON, Province of Laguna, near Cavinti, *For. Bur. 10163 Curran:* Province of Tayabas, Lucban, *Elmer 8233, 9233:* Province of Camarines, Pasacao, *Ahern 203:* Province of Sorsogon, Sorsogon, *For. Bur. 10521 Curran* (type).

This and the allied species seem closely related to *Eugenia polycephala* Miq., but do not apear to be identical with it.

Local names, *Balasugan,* Cagayan; *Lapote,* Laguna; *Balegan,* Sorsogon; *Maigang,* Leyte.

95. **Eugenia oblanceolata** sp. nov.

Inflorescentiis cymoso-paniculatis, axillaribus vel terminalibus, floribus sessilibus, tetrameris; calycis tubo subhemispherico, staminibus brevibus: foliis subcoriaceis, oblanceolatis vel late oblanceolatis, acuminatis, basi saepissime cordatis rarius obtusis, magnis; venis utrinque 16–25.

Inflorescence cymose-paniculate, about 6 cm long, the rachis and its branches stout, 4-angled, subtended by bracts attaining 7 mm in length but often shorter, the individual flowers sessile, their bractlets 4, conspicuous, oval or nearly orbicular, 2–3 mm long: calyx-tube nearly hemispherical, 4 mm long, 3–5 mm in diameter at the base of the lobes, extending 2–3 mm beyond the ovary; calyx-lobes 4, 0.7–0.8 mm long, 1.5–2 mm wide, their apices rounded or truncate; petals falling calyptrately, the cap about 3 mm in diameter, about 1 mm in vertical height; stamens numerous, the filaments 2–4 mm long, the anthers about 0.4 mm long; style 6–7 mm long, tapering; ovary 2-celled.

A tree about 10 m high, with a trunk 17.5 cm in diameter, its ultimate branches 4-angled and often narrowly winged, with brownish or purplish bark when dry: leaves sessile or subsessile, the lamina subcoriaceous, oblanceolate or broadly oblanceolate, the youngest excepted 16–32 cm long, 6–11 cm wide, acuminate at both extremities, at the base often for one-third the length of the leaf, shortly and obtusely at the apex, the base auriculate or merely obtuse; lateral veins 16–25, less distinct toward the extremes, crowded near the base, the midvein strongly developed and projecting; finer venation evident but not conspicuous.

SAMAR, (probably), *Cuming 1676* (type). MINDANAO, District of Davao, Santa Cruz, *Williams 2862.*

96. **Eugenia intumescens** sp. nov.

Inflorescentiis terminalibus vel in foliorum superiorum axillis, cymoso-paniculatis, rhachide saepissime crassa: calycis tubo turbinato, lobis 4; petalis, 4, liberis; staminibus numerosis: foliis sessilibus vel subsessilibus, coriaceis, ellipticis, oblanceolatis, vel obovatis, basi cordatis, apice acuminatis; venis utrinque 12–18.

Inflorescences cymose-paniculate, terminal or less often in the axils of the uppermost leaves, 9–17 cm long, attaining a width of 10 cm but usually less, the rachis and its branches 4-angled, often very stout (5 mm wide), the bracts lanceolate, acute or subacute, often foliaceous, even 2.5 cm long; flowers mostly clustered at the ends of the branches of the rachis, usually three together, the individual flowers sessile, surrounded by two decussate pairs of ovate bracteoles 2–3 mm long: calyx-tube turbinate, 4–5 mm long, 5–6 mm wide at the base of the lobes, projecting about 3 mm beyond the ovary; calyx-lobes 4, rounded, 1.5–3 mm long, 2–3 mm wide; petals 4, free or very slightly attached at their bases, orbicular-ovate; staminal disk thin; stamens numerous, the filaments about 6 mm long, the anthers 0.5 mm long; style 6 mm long, at anthesis nearly hidden by the stamens; ovary 2-celled.

A tall tree, its branchlets 4-angled or nearly terete, not or obscurely winged, the dry bark purplish or brown; leaves sessile or with petioles attaining a length of 5 mm; the coriaceous lamina elliptic, oblanceolate or obovate, 10–23 cm long, 5–11 cm wide, the base shallowly cordate, the apex narrowed into a short and comparatively slender obtuse acumen; primary lateral veins on each side of the midrib 12–18, forming a distinct submarginal vein, upper surface of the lamina purplish-brown, shining, the under surface, with the exception of the veins, much paler, green to brown.

LUZON, Province of Benguet, *For. Bur. 18349 Alvarez* (probably): Province of Zambales, Subig, *Merrill 2202:* Province of Rizal, Bosoboso, *Merrill 1877, For. Bur. 3087 Ahern's collector;* Antipolo, *For. Bur. 480 Ahern's collector* (type), *Bur. Sci. 3360 Ramos.* MASBATE, Marintoc River, *Merrill 2769.*

Local names, *Malaruhat,* Zambales; *Dugan,* Rizal; *Hagoho,* Masbate. The last two look like mistakes for *Tarrietia sylvatica* (*Dungon*), and *Casuarina equisetifolia* (*Agoho*), respectively, both very different.

97. **Eugenia curtiflora** Elmer Leafl. Philip. Bot. 1 (1908) 328.

Arbor: inflorescentiis axillaribus, brevibus, bracteatis; calycis tubo turbinato; petalis calyptratis; staminibus numerosis, brevibus: foliis coriaceis, oblanceolatis, basi acutis decurrentibusque, apice in acumen breve acutum vel obtusum contractis, margine revolutis; venis utrinque 9–11.

LUZON, Province of Benguet, Baguio, *Elmer 8768.*
Endemic.

98. **Eugenia melliodora** sp. nov.

Arbor alta: inflorescentiis axillaribus vel in axillis defoliatis, divaricato-cymosis, trichotomis, floribus sessilibus; calyce turbinato, lobis 4,

rotundatis, brevibus; corolla calyptrata; staminibus numerosis, brevibus; ovario biloculari: foliis chartaceis, obovatis vel ellipticis, apice acuminatis, basi acutis; venis utrinque 12–15.

Inflorescences axillary or in the axils of fallen leaves, pyramidal-ovate, 3–4 cm long, 3–6 cm wide at base, usually thrice trichotomous, the peduncle nearly 1 cm long or wanting, the rachis and its branches about 2 mm in diameter, with orbicular-ovate bracts about 1.5 mm long at some or all of the articulations; individual flowers in threes, sessile, each subtended by two decussate pairs of bracteoles, 2.5 mm long, 3 mm wide, broadly rounded, or one of these wanting between closely appressed flowers; calyx-tube turbinate or broadly oblanceolate, extending about 2.5 mm beyond the ovary, 4–5 mm long, 2.5–3 mm wide at the base of the lobes; calyx-lobes 4, submembranaceous, 2–2.5 mm wide, about 0.5 mm long, rounded; petals falling calyptrately, the cap about 3 mm in diameter, 1 mm in vertical height; staminal disk inconspicuous; stamens numerous, their filaments 3–4 mm long, the lanceolate anthers about 0.4 mm long; style 5 mm long; ovary 2-celled, with numerous small ovules.

A tall tree with a stem 60 cm in diameter, the terete or nearly terete branches covered with gray bark; leaves with caniculate petioles 7–13 mm long, the lamina chartaceous obovate or elliptic, 12–17 cm long, 6.5–9 cm wide, acute at the base, contracted at the apex into a short obtuse acumen, the margins slightly revolute; primary lateral veins on each side of the midrib 12–15, forming a definite submarginal vein, or conspicuous on the lower surface, but less so than the midvein.

LUZON, Mindoro, Baco River, *McGregor 224*.

Very closely allied to the preceding, from which fuller collections may show it not to be distinct. Apparently differing by the size, shape, and texture of the leaves.

BLANCO'S SPECIES OF MYRTACEÆ.

Nearly all of these are referred to in the proper places in the text, but a brief summary may be advisable. In no case, is his description satisfactory, and some of his species may well be mixtures, and there is reason for supposing that others are twice described, apart from mere changes of name.

1. EUGENIA MALACCENSIS Blanco Fl. Filip. (1837) 415; ed. 2 (1845) 290.

This has generally been reduced to *E. jambos*, and there is every reason to believe that the reduction is correct.

2. MYRTUS MANANQUIL l. c. 421.

Eugenia mananquil ed. 2 290.

E. lobas ed. 1 857.

E. canliflora (*cauliflora*) ed. 2 291.

The second and fourth names are his changes of the first and third. These seem to me to be the same, at least possibly. *E. mananquil* has been reduced to *E. javanica*, but he very carefully specifies that the fruit is rounded and not depressed-hemispheric, which should exclude *E. javanica*. The species here connected with his names is the commonest indigenous one, to which his statements nearly apply.

3. E. BAUANGICA ed. 1 416; ed. 2 290.

The description is entirely inadequate, but the chances are that *E. malaccensis* Linn. is intended.

4. E. MONTANA ed. 1 416; ed. 2 291.

Naves interpreted this to be the species here named *E. calubcob*. Villar considered him to be wrong, and reduced it to *E. macrocarpa* Roxb., a species not known to occur in the Islands. This was apparently done by reason of the description of the fruit, but apart from the local names cited by Blanco there is little reason to think that Naves was wrong.

5. E. GLANDULOSA ed. 1 417; ed. 2 291.

The only Philippine species at all answering the description is *Rhodomyrtus tomentosa,* but the known distribution of the latter makes the identification unlikely.

6. E. JAMBOS ed. 1 416; ed. 2 290 (*yambos*).

This has previously been reduced to *E. malaccensis,* to which there is little intrinsic objection. The probabilities are much greater that *E. javanica* was intended: it seems to be the only species near Manila known as *Macupa,* though farther south that name belongs to *E. malaccensis.*

7. PSIDIUM AROMATICUM ed. 1 417.

P. pyriferum ed. 2 292.

This is certainly *P. guajava* Linn., of which both the varieties into which Linnaeus specifically divided it are very common in the Philippines.

8. CALYPTHRANTHES JAMBOLANA ed. 1 418.

Syzygium jambulanum ed. 2 293.

Undoubtedly *E. jambolana* Lam.

9. CALYPTHRANTHES MAKAL ed. 1 419.

C. zuzygium? ed. 2 293.

Villar reduced this to *E. operculata* Roxb., to which the species here described as *E. clausa* is at least very closely allied. There is but one objection to connecting Blanco's species with the latter; both in the Indian and Philippine plants, the inflorescence is on the older branches, mostly below the leaves; Blanco says "Flores terminales." No other species agrees nearly as well with his other statements, the distinctive character being the deciduous calyx-apex. Both of Blanco's specific names had been previously used in *Calyptranthes,* and were evidently intended as mere identifications.

10. CALYPTHANTHES RAMIFLORA ed. 1 420.

Syzygium latifolium ed. 2 294.

This is most probably *Eugenia similis* Merr.

11. MYRTUS TRIPINNATA ed. 1 421.

Myrtus subrubens ed. 2 294.

There are many reasons for supposing this to be *E. luzonensis* Merr., but the description agrees slightly more perfectly with a nearly allied species, to which Blanco's specific name has here been attached.

12. MYRTUS COMMUNIS Blanco ed. 1 422; ed. 2 295.

There is no doubt that this is *Decaspernum blancoi.*

13. PLINIA PANICULATA ed. 1 423; ed. 2 290.

Reduced by Villar to *Kayea racemosa,* correctly as to genus, the species now being known as *Kayea paniculata* (Blanco) Merr. It is thus excluded from the family.

14. LEGNOTIS LANCEOLATA ed. 1 445.
Metrosideros pictipetala ed. 2 295.
If this is any species represented by recent collections, it is most probably *Decaspermum paniculatum*.

15. MELALEUCA GRANDIFLORA ed. 1 615.
Bombax ceiba ed. 2 372.
The second identification is correct.

The following were credited to the Philippines by Fernandez-Villar in the Novissima Appendix, but have not been exactly matched in recent collections.

BAECKEA FRUTESCENS Linn. Sp. Pl. (1753) 358.
This was credited on the authority of previous authors, who did so by wrongly localizing *Cuming 2269*, the type of *B. cumingiana* Schauer. Villar says that he had not seen it: *Cuming 2269* came from Malacca. To be excluded.

MELALEUCA LEUCADENDRON Linn. Mant. (1767) 105.
Reported as cultivated in Manila: by others its range has been extended to the Philippines, through another wrong localization, *Cuming 2272*, the type of *M. cumingiana*, generally reduced to *M. leucadendron*, being also from Malacca.

EUCALYPTUS GLOBULUS Labill. Voy. 1 (1799) 153, *pl. 13*.
Credited as cultivated: none of the eucalypti at present in cultivation here seem to be this species.

METROSIDEROS VERA Lindl. Collec. Bot. (1821) *pl. 18*.
Credited merely as the identification of *M. pictipetala* (see above), Villar saying that he had not seen it. It is possible that some of our sterile material may be of this species, but the probabilities are otherwise.

RHODAMNIA TRINERVIA Blume Mus. Bot. Lugd.-Bat. 1 (1851) 79.
A third case where others had credited a Cuming plant from Malacca to the Philippines: Villar, again, had not seen it.

DECASPERMUM RUBRUM Baill. Hist. Pl. 6: 341.
Nelitris rubra Blume Mus. Bot. Lugd.-Bat. 1 (1851) 73.
A wrong identification of *Myrtus communis* Blanco (*Decaspermum blancoi* Vidal).

EUGENIA FORMOSA Wall. Pl. As. Rar. 2 (1831) 6, *pl. 108*.

E. AMPLEXICAULIS Roxb. Fl. Ind. 2 (1832) 483.

E. MUNRONII Wight Ill. 2: 14.

E. AQUEA Burm. f. Fl. Ind. (1768) 114.

E. DENSIFLORA DC. Prodr. 3 (1828) 287.

E. MACROCARPA Roxb. *l. c.* 497.

E. GRANDIS Wight Ill. 2: 17.

E. LAETA Ham. in Mem. Wern. Soc. 5 (1826) 338.

E. GRIFFITHII Duthie in Hook. f. Fl. Br. Ind. 2 (1878) 481.

E. RUBENS Roxb. *l. c.* 496.

E. CYMOSA Lam. Encycl. 3 (1789) 199.

E. PELLUCIDA DUTHIE *l. c.* 485.
See *E. cinnamomea* Vidal.

E. GRATA Wight. Ill. 2: 15.

E. LINAETA Duthie *l. c.* 487.
See *E. longiflora* F.-Vill.

E. RUBRICAULIS Duthie *l. c.* 487.

E. PYRIFOLIA Duthie *l. c.*

E. MONTANA Wight Ic. 3 (1846) *pl. 1060.*

E. GARDNERI Bedd. For. Man. Bot. 108.
Probably is *E. salinga.*

E. CARYOPHYLLAEA Wight Ic. (1842) *pl. 540.*

E. EXPANSA Duthie *l. c.* 491.

E. OBLATA Roxb. *l. c.* 493.

E. LAEVICAULIS Duthie *l. c.* 492.

E. CONGLOMERATA Duthie *l. c.* 497.

E. TETRAGONA Wight Ill. 2: 16.

E. OCCLUSA Kurz in Journ. As. Soc. Bengal 45² (1876) 130.

E. OPERCULATA Roxb. *l. c.* 486.
See *E. clausa.*

E. HEYNEANA Duthie *l. c.* 500.

E. BRACTEATA Roxb. *l. c.* 490.

EXCLUDED SPECIES OF OTHER AUTHORS.

GERMARIA LATIFOLIA Presl Epimel. Bot. (1851) 221.

Subsequently confused by many authors with *Pygeum latifolium* Miq., (*Rosaceae*), but a distinct sepecies, *P. preslii* Merr. in Philip. Journ. Sci. 3 (1908) Bot. 227.

RHODAMNIA GLABRA Vidal Rev. Pl. Vasc. Filip. (1886) 129.

This is a case of wrong identification, the species being *Memecylon oligoneuron* Blume Mus. Bot. Lugd.-Bat. 1 (1851) 353. (*Melastomataceae.*)

See Merrill *supra,* p. 304.

The following local names have been found on sheets belonging to the species indicated:

Adios, *Tristania decorticata.*
Ambabacit, *Eugenia parva.*
Amtuc, *E. bordenii.*
Ansa, *E. mananquil.*
Anubing, *E. benthamii.*
Apalang, *E. bordenii.*
Arahan, *E. benthamii.*
Arinaya, *E. perpallida.*
Bagabug, *E. mananquil.*
Bagohion, *E. philippinensis.*
Bagotalisi, *E. gigantifolia.*
Baguitulay-bayaboj, *Tristania decorticata.*
Balacbac, Balacbat, Balocboc, *E. xanthophylla.*
Balasugan, *E. polycephaloides.*
Balogan, *E. polycephaloides.*
Balteak, *E. alvarezii.*
Baltic, *E. acrophila.*
Bansalaguin, *E. grisea.*
Bansalagun, *E. mimica.*
Baracbac, *E. calubcob, E. subrotundifolia, E. xanthophylla.*
Barangan, *E. subrotundifolia.*
Batmay, *E. congesta.*
Bayabas, *Psidium guajava.*
Bayacbac, *E. subrotundifolia.*
Bignay-maching, *E. perpallida.*
Bindang, *Tristania decorticata.*
Binloan, *E. saligna.*
Biracbac, *E. arcuatinervia.*
Bislot, *E. bordenii, E. xanthophylla.*

Bitbid, *E. mananquil.*
Buabua, *E. mananquil.*
Bujucan, *E. saligna.*
Bulog, *E. perpallida.*
Bumug, *E. luzonensis.*
Butadtad, *E. grisea.*
Cagucug, *E. mananquil.*
Cahoybod, *E. saligna.*
Cajocko, *E. mananquil.*
Calaum, *E. glaucicalyx.*
Calobcob, Calopcop, Calubcob, Calubcub, Calugcog, *E. bataanensis, E. calubcob, E. crassipes.*
Cansilay, *Decaspermum paniculatum.*
Carobcob, *E. calubcob.*
Carra, *E. claviflora.*
Carutad, *E. arcuatinervia.*
Cayococ, *E. xanthophylla.*
Cayogpug, *E. calubcob.*
Conomay, *E. grisea.*
Cupcup, *E. calubcob.*
Cusara, *E. claviflora.*
Cuyagin, *E. saligna.*
Dambuhala, *E. mananquil.*
Digotnalit, *Decaspermum blancoi.*
Ductulan, *E. luzonensis.*
Dugan, *E. intumescens.*
Dugayon, *Decaspermum paniculatum.*
Duhat, *E. jambolana.*
Gamatulay, *E. claviflora.*
Guayabas, *Psidium guajava.*
Guenayang, *E. cinnamomea.*
Guisgues, *E. astronioides.*
Guisihan, *E. longiflora.*
Gulagan, *E. subsessilis.*
Hagoho, *E. intumescens.*
Hangos, *E. aherniana.*
Jamo, *E. malaccensis.*
Jangus, *E. mananquil.*
Kaguku, *E. mananquil.*
Kamulauan, *Xanthostemon verdugonianus.*
Lagilagi, *E. grisea.*
Langlangis, *E. cinnamomea.*
Lapinig, *E. xanthophylla.*
Lapote, *E. polycephaloides.*
Lipote, *E. garciae.*
Lumboi, lumboy, *E. jambolana.*
Lumboi bundoc, *E. luzonensis.*
Macaasim, Macaasin, *Decaspermum paniculatum, E. benthamii, E. bordenii, E. mimica, E. philippinensis, E. vidaliana.*
Macopa, Macupa, *E. javanica, E. luzonensis, E. malaccensis.*
Magcono, *Xanthostemon verdugonianus.*
Magcusison, *E. rosenbluthii.*
Maigang, *E. polycephaloides.*
Malaambu, *E. subrotundifolia.*
Malabayabas, *Tristania decorticata, E. brunnea.*
Malacolubcob, Malacolubcub, *E. barnesii, E. bordenii, E. robertii.*
Maladuhat, *E. mimica.*
Malahaguis, *E. mananquil.*
Malaruhat, *Decaspermum paniculatum, E. arcuatinervia, E. bataanensis, E. benthamii, E. bordenii, E. brunnea, E. calubcob, E. decipiens, E. intumescens, E. longiflora, E. luzonensis, E. mananquil, E. mindorensis, E. saligna, E. similis, E. whitfordii.*
Malaruhat na pula, *E. decipiens, E. luzonensis, E. perpallida.*
Malaruhat na puti, *E. bordenii, E. clausa, E. claviflora, E. perpallida, E. similis.*
Malaruhatsapa, *E. saligna.*
Malasulasi, *Leptospermum flavescens.*
Malatalisi, *E. gigantifolia.*
Malatambis, *E. hutchinsonii, E. williamsii.*
Malatampoy, *E. macgregorii, E. xanthophylla.*
Malayambo, *E. phanerophlebia, E. philippinensis.*
Mancono, *Xanthostemon verdugonianus.*
Mangcopa, *E. malaccensis.*
Maramatam, *E. bordenii.*
Maramaotan, *E. claviflora.*
Mareeg, *E. glaucicalyx.*
Midbid, Midbit, *E. mananquil.*
Mungilkil, *E. mananquil.*
Paitan, *E. similis.*
Palo de hierro, *Xanthostemon verdugonianus.*
Palo Maria, *E. macgregorii.*
Pamayausin, *E. roseomarginata.*
Panglomboyen, *E. bordenii.*
Panglongbuyan-gangoan, *E. claviflora.*
Panglongbuyen-copaiopa, *E. mananquil.*
Pango, *E. arcuatinervia, E. atropunctata.*
Panomanagan, *E. parva.*
Payetan, *E. perpallida.*
Pielan, *E. perpallida.*
Pusopuso, *E. cinnamomea.*

Putyan, *E. barnesii.*
Salilihan, *Decaspermum paniculatum.*
Salingsingang, *Decaspermum paniculatum.*
Silda, *E. candelabriformis.*
Sudsod, *E. astronioides.*
Taguilumboy, *E. saligna.*
Tambis, *E. mindanaensis.*
Tambistambis, *E. philippinensis, E. sessilis.*
Tambitambi, *E. philippinensis.*
Tampoi, Tampul, Tampuy, *E. calubcob, E. jambos, E. xanthophylla.*
Tamulod, *E. merrittiana.*
Tawalis, *Osbornia octodonta.*
Tayomtayom, *Decaspermum paniculatum.*
Tiga, *Tristania decorticata.*
Titimi, *E. diplycosifolia.*
Tubaltubal, *E. triphylla.*
Tulambis, *E. philippinensis.*
Tuoy, *E. calubcob.*
Ualisualisan, *Decaspermum blancoi.*

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VIII. INDEX.

I. INTRODUCTION.

ERRONEOUS POPULAR NOTIONS WITH REGARD TO EASTERN TIMBERS.

The newcomer in the Orient is usually surprised at finding that soft woods are not uncommon and that a large part of the timber of the region is of medium or light weight. The popular notion of eastern timbers seems to be that they are mainly hard and heavy, ornamental, furniture or cabinet woods. This notion is probably due to the fact that, until recent years, the only eastern woods which have reached the European markets have been a few of the more valuable ones for furniture and cabinet work; as, ebony, satinwood, rosewood, etc. Most European and American works which mention eastern woods at all con-

sider only examples like satinwood, rosewood or teak and give little or no account of the woods of the great family of *Dipterocarpaceæ*, which furnishes much the largest part of the timber of this part of the world. This is as unreasonable as it would be to take a few of the furniture woods of North America, as black walnut (*Juglans nigra*) or the wild black cherry (*Prunus serotina*), as representative of the woods of the country. In the eastern tropics, the woods of the family *Dipterocarpaceæ* are to the trade what the pines, spruces, firs, hemlocks, oaks and beeches are to the trade in temperate North America and Europe. This family, while it supplies many valuable hardwoods, supplies also the most widely used soft and medium grade woods of the eastern tropics. So wide is its distribution and so general the use of its wood that I believe that all other woods could be spared from many eastern markets without seriously hampering work or affecting prices.

OBJECT OF THIS WORK.

There is a great deal of confusion in the use of the common names of the different woods. Many of the woods of the region are of wide distribution; but, they are known by different names in different countries. This work is undertaken with the object, first, of correlating Philippine woods with the related or identical forms in other sections and then of calling attention to the structure, uses and distribution of the eastern woods.

DEFINITION OF THE INDO-MALAYAN REGION.

This is taken to include all of Ceylon, British India, Burma, the Andamans, Siam, Cochin China, the Malay Peninsula, Sumatra, Java, Borneo, the Philippines, and all of the Malay and Indian Archipelago down to New Guinea. In other words, it is meant to include nearly all of the tropical East. It constitutes a region which geographically and commercially is quite distinct. Japan with its temperate-zone woods constitutes a very distinct group. Australia is also very distinct, with its eucalyptus and other characteristic woods. Wherever woods from either of these regions come into tropical markets to any considerable extent, they are considered in this paper. The number of cases in which woods of the temperate regions are of commercial importance in the eastern tropics is really very small. First of all would come the use in India of the woods grown in the temperate forests of the lower Himalayas. After this come the various eucalyptus species exported from Australia, the Oregon pine from the United States, and the camphorwood from Japan and Formosa.

REVIEW OF PREVIOUS WORK AND ACKNOWLEDGMENTS.

In the course of the comparative study of the woods of this region, collections of botanical and commercial material have been made in some of the countries considered and material from other countries has been

secured by exchange. Much assistance in the way of information and material has been given by various persons and institutions in Sarawak, Dutch Borneo, British North Borneo, the Straits Settlements and Federated Malay States, New Guinea, Australia, Cochin China, Burma, British India and Ceylon. Special acknowledgments for material furnished are due the following: Dr. M. Treub, director of agriculture, Buitenzorg, Java; A. M. Burn-Murdoch, conservator of forests, Federated Malay States and Straits Settlements, Kuala Lumpur; H. N. Ridley, director Botanic Gardens, Singapore; J. H. Hewitt, late curator, Sarawak Museum, Kuching; M. G. Bradford, municipal officer, Kuching, Sarawak; J. C. Moulton, curator of the museum, Kuching, Sarawak; R. S. Douglas, Resident, Baram district, Sarawak; M. Hagadorn, Samarinda, Dutch East Borneo; A. J. Cools, Berouw, Dutch East Borneo; G. J. Altman, Sandakan, British North Borneo; Dr. H. L. E. Luehring, Anglo-Chinese School, Penang; M. Haffner, director of agriculture, Saigon, Cochin China; R. S. Troup, Imperial Forest Research Institute, Dehra Dun, northwest provinces, India; C. E. Brasier, conservator of forests central circle, Madras, India; F. E. Lewis, Batticaloa, Ceylon; Rev. Copland King, Ambasi, Papua, British New Guinea; R. T. Baker, curator Technological Museum, Sydney, New South Wales; T. Kawakami, bureau of industry, Formosan government, Taihoku, Formosa.

Previous work on the woods of this region was as follows:

Gamble, J. S. A Manual of Indian Timbers. This is by far the most complete piece of work on eastern timbers. The notes are very full and I have quoted from them very largely in my species notes.

Van Eeden, F. W. Houtsoorten van Nederlandsch Oost-Indië.-Kol. Museum te Haarlem 1906. This gives very useful notes on a large number of species.

Ridley, H. N. Timbers of the Malay Peninsula. Agric. Bull. S. S. and F. M. S. (1901–2). Gives excellent notes on a large number of species of the Malay Peninsula.

Nördlinger, H. Holzquerschnitte. Gives very fine cross sections of a number of Indian woods and some very brief notes as to structure.

Wiesner, J. Die Rohstoffe des Pflanzenreichs. Vol. II. Describes in detail a few species and lists a number of others from this region.

Janssonius, H. H. Mikrographie des Holzes. Describes in great detail a number of Javanese species.

Laslett. Records tests of the strengh of a number of Indian timbers.

Stone, H. Timbers of Commerce. Includes a very few eastern timbers.

Boulger, G. S. Wood. Gives brief notes on quite a number of species.

Newton, H. In 1882 published the results of a number of tests on about twenty different timbers of the Straits Settlements. The botanical determinations for this work were very uncertain and it is often very difficult to determine just what wood was meant.

GARDNER, R. Mechanical Tests of Thirty Different Philippine Woods. For. Bur. (Philip.) Bull. **4** (1907).

BECCARI, O. Nelle foreste di Borneo. Florence, 1902. In this work, Doctor Beccari gave brief notes on the nature and uses of many of the woods of Sarawak. Detailed structural notes on these woods collected by Doctor Beccari were published in Malpighia by Dr. G. Bargagli-Petrucci, and these two works constitute the best contribution to our knowledge of the woods of Borneo.

Besides these there have been a number of individual articles on particular woods; but there has been very little done in the way of comparative study of the woods of the whole region.

II. PROPERTIES OF WOOD.

COMPARISON OF WOODS OF THE TROPICS WITH THOSE OF TEMPERATE REGIONS.

In general, tropical woods contain more of color than do those of temperate regions. Cognate with this is the fact of their greater weight and hardness. Distinct seasonal growth with the formation of definite rings of seasonal growth is much less common in the tropics than in the temperate regions.

WEIGHT AND HARDNESS.

These two qualities usually go together; but the weight can not be considered as an accurate measure of hardness. It is usually true that a very heavy wood is also very hard; but this is not always the case. Occasionally, also, a wood which is only moderately heavy will prove to be very hard; consequently, it is not possible to combine these two qualities in one table.

Weight.—The weight of a given wood is due to the density of the walls of the different elements together with the nature of the contained deposits and the closeness of crowding together of the elements.

In published statements of weight, there is a considerable factor of error due to natural variability in density, carelessness in using sapwood and heartwood indiscriminately, and to the fact that some workers have not used carefully dried wood. It is perfectly plain that any measurement of a moisture-containing wood which does not indicate the percentage of contained moisture is a source of confusion in comparative studies. Unfortunately, some workers have published weights of "air-dry" wood without indicating what percentage of moisture was meant.

In the following table only a rough comparison has been possible among the most used woods of this part of the world. Wherever possible, large numbers of samples of a given wood have been tested. In many cases this has not been possible and it has been necessary to rely on the work of others or on comparative estimates made by traders and timber workers.

It has seemed best to use only four classes, as outlined by Gardner and

already used by me, viz, very heavy, heavy, moderately heavy, and light. Unless specially indicated the weight has been determined in Manila.

Some of those listed in the *heavy* class are frequently found to furnish examples that are properly described as *very heavy*. I have indicated this by italics in the table.

As indicated in the table, the light woods are relatively few. Some of them, however, are found in considerable quantity. The table will not show all of the woods which will sink when green. Many of those in the heavy class are heavier than water when green. The number of woods which are really heavier than water when absolutely dry is relatively very small. Those woods of the *very heavy* class which are actually heavier than water when dry are indicated by italics. Some of those not so marked may occasionally have a weight in excess of that of water.

Table of comparative weights of eastern woods.

Very heavy. Sp. gr., 0.90 or more: 900 kilos or more per M³: 56 lbs. or more per cu. ft.	Heavy. Sp. gr., 0.70–0.90: 700–900 kilos per M³: 44–56 lbs. per cu. ft.	Moderately heavy. Sp. gr., 0.50–0.70: 500–700 kilos per M³: 31–44 lbs. per cu. ft.	Light. Sp. gr., 0.50 or less: 500 kilos or less per M³: 31 lbs. or less per cu. ft.
Mancono.	*Dungon.*	Acle.	Lauan.
Nani.[b]	*Ipil.*	Acleng-parang.[a]	Baticulin.
Dungon-late.[a]	*Mirabow.*[b]	Amuguis.	Calantas.
Ebony.[a]	*Yacal.*	Anubing.	Mayapis.
Billian.[b]	*Betis.*	Apitong.	Red lauan.
Anjan.[a]	*Bansalaguin.*	Balacat.	Dita.
Tapang.	*Aranga.*	Banaba.	Cupang.
Bacauan.[a]	*Sasalit.*	Bancal.	Teluto.
Pennagah.[a]	*Liusin.*	Banuyo.	Malapapaya.
Red sanders.[a]	*Agoho.*	Bansu.[a]	Meranti.[b]
Rohan.[a]	*Griting.*[b]	Balinhasay.	Seriah.
Bolongeta.	*Api-api.*[a]	Batino.	Jelutong.
Camagon.	*Jarrah.*[b]	Blimbing.[a]	Pincapincahan.[a]
Pototan.[a]	*Blue gum.*[b]	Butea.[a]	Kapok.[a]
Tangal.[a]	Mas-mora.[a]	Calumpit.	Silk cotton tree.[a]
Chengal.	Alupag.	Camanchilis.[a]	Tui.[a]
Selangan batu.	Ballow.	Camphor.[a]	Mangasinoro.
Kulim.	Banalo.[a]	Cato.	Kayu garu.[a]
Petaling.	Babul.[a]	Champaca.[a]	Saleng.
Anan.[a]	Batete.	Black wattle.[a]	Ratilis.
Malabera.	Batitinan.	Dalinsi.	Dapdap.[a]
Tampinis.	Blackwood.[a]	Dao.	Ilang-ilang.[a]
Peniow.	Calamansanay.	Duguan.	Dún.[a]
Kranji.[b]	Catmon.	Durian.[a]	Sterculia fœtida.[a]
Tamarind.[a]	Cay go.	Del.[a]	Gyrocarpus jacquini.[a]
Pynkadu.[a]	Chengal.	Bintangor.[a]	Barringtonia racemosa.[a]
Camuning.[a]	Chittagong.[a]	Guava.[a]	Duabanga sp.[a]
Satinwood.[a]	Eng.[a]	Guijo.	Tetrameles nudiflora.[a]
Sandal.[a]	Gurjun.[a]	Lanete.	Hymenodictyon excelsum.[a]
Boxwood.[a]	Hora.[a]	Makai.[a]	
Sappan.	Ingyin.[a]	Malasantol.	Sarcosperma arboreum.[a]
Saj.[a]	Kapor.[b]	Malugay.	Octomeles sumatrana.[b]
Harra.[a]	Kaunghmu.[a]	Lumbayao.	Gerunggang.

[a] These woods are placed according to their arrangement in Gamble, *l. c.*

[b] These woods are placed according to information given in Van Eeden, *l. c.*

Table of comparative weights of eastern woods—Continued.

Very heavy. Sp. gr., 0.90 or more: 900 kilos or more per M³: 56 lbs. or more per cu. ft.	Heavy. Sp. gr., 0.70–0.90: 700–900 kilos per M³: 44–56 lbs. per cu. ft.	Moderately heavy. Sp. gr., 0.50–0.70: 500–700 kilos per M³: 31–44 lbs. per cu. ft.	Light. Sp. gr., 0.50 or less: 500 kilos or less per M³: 31 lbs. or less per cu. ft.
Moka.[a]	Kolavu.[a]	Mango.[a]	Hernandia peltata.
Culis.[a]	Lanotan.	Mayapis.	
Khair.[a]	Leban.[b]	Narra.	
Longan.[a]	Mahogany.[a]	Nato.	
Cangu.[a]	Macaasin.	Nangka.[a]	
Thitya.[a]	Mangachapuy.	Palo maria.	
Talura.[a]	Molave.	Pili.	
Thitsi.[a]	Nedun.[a]	Mahogany.[a]	
	Nireh.[b]	Renghas.[a]	
	Padauk.[a]	Sacat.	
	Pagatpat.	Santol.	
	Petir.	Talisay.	
	Rassak.	Tamayuan.	
	Sal.[a]	Tanguile.	
	Piagao.[b]	Teak.	
	Siris.[a]	Toog.[a]	
	Sissoo.[a]	Thinkadu.[a]	
	Supa.	Silky oak.[a]	
	Tindalo.	Kumpas.	
	Thingan.[a]		
	Trincomali.[a]		
	Tucan-calao.		
	Ubar		

[a] These woods are placed according to their arrangement in Gamble, *l. c.*
[b] These woods are placed according to information given in Van Eeden, *l. c.*

Hardness.—It is much more difficult to get a satisfactory measure of hardness than it is to get the weight. No completely satisfactory method of determining relative hardness has come to my notice. There are, however, certain comparative values recognized and these I have endeavored to show in the following very imperfect table. I have been able to use only five categories, viz, very hard, hard, moderately hard, soft and very soft. Those woods classified by Gamble as extremely hard and extremely soft will naturally come under the very hard and very soft classifications in this table.

Many of the very hard and very heavy woods are very dark in color. In these cases the sapwood is usually very much lighter in color and weight and is softer. In these woods it is the deposit of the dark-colored substance in the wood elements when the sapwood changes to heartwood that causes the hardness and weight. This is, of course, not the sole cause. There are some woods where the sap and heart are not noticeably different in color. In these cases, there is very little difference in weight and hardness in the different parts of the tree. If such woods are heavy, it will usually be found to be due to the thickness of walls of the fibers and the close crowding together of the wood elements. This is the case in *agoho* and in *boxwood.*

Table of comparative hardness of eastern woods.

Very hard.	Hard.	Moderately hard.	Soft.	Very soft.
Anjan.	Guijo.	Teak.	Meranti.	Calantas.
Mancono.	Sal.	Banuyo.	Lauan.	Plai.
Anan.	Acle.	Banaba.	Pine.	Cotton tree.
Sissu.	Babul.	Kapor.	Champaca.	Silk cotton.
Ebony.	Ballow.	Deodar.	Balacat.	Red lauan.
Dungon-late.	Chittagong.	Jak.	Gerunggang.	Dapdap.
Dungon.	Nireh.	Kiamil.	Kappla.	Ratilis.
Billian.	Eng.	Bansu.	Lumbayao.	*Hibiscus* sp.
Agoho.	Molave.	Cashew.	Mayapis.	Nivar.
Tapang.	Tindalo.	Apitong.	Jelutong.	
Bansalaguin.	Yacal.	Malasantol.	Mangasinoro.	
Sasalit.	Batitinan.	Tanguile.	Black wattle.	
Liusin.	Macaasin.	Sacat.	Telambu.	
Betis.	Amuguis.	Santol.	Ilang-ilang.	
Aranga.	Palo maria.	Narra.	Makai.	
Miraboo.	Ipil.	Piney varnish.	Durian.	
Camagon.	Malugay.	Bintangor.	Blimbing.	
Kumpas.	Supa.	Kolavu.	Samadera.	
Bacauan.	Nedun.	Padouk.	Pili.	
Pototan.	Tamarind.	Simpor.	Mango.	
Tangal.	Mas-mora.	Gurjun.	Bancal.	
Chengal.	Siris.	Hora.	Tui.	
Selangan batu.	Acleng-parang.	Thinkadu.	Duguan.	
Kulim.	Camanchilis.	Dun.	Kayu garu.	
Petaling.	Thingan.	Thitka.	Toon.	
Malabera.	Cangu.	Guggar.	Pincapincahan.	
Peniow.	Talura.	Kharpat.	Teluto.	
Pennagah.	Mahogany.	Puna.	Malapapaya.	
Tampinis.	Kakira.	Guava.	*Tetrameles* sp.	
Plawan.	Talisay.	Jaman.	*Sonneratia* sp.	
Sudjung.	Thitsein.	Camphor.	*Duabanga* sp.	
Ballow.	Saj.	Toog.	*Gyrocarpus* sp.	
Tamayuan.	Dahu.	Banalo.	*Kleinhofia* sp.	
Alupag.	Griting.	Del.	*Octomeles* sp.	
Camuning.	Jarul.	Lanete.		
Red sanders.	Sandal.			
Trincomali.	Api-api.			
Blackwood.	Cato.			
Kranji.	Tucan-calao.			
Pynkadu.	Pagatpat.			
Thitya.				
Khair.				
Rohan.				
Satinwood.				
Kosum.				
Banderu.				
Thitsi.				
Harra.				
Kindal.				
Sappan.				
Thingyin.				
Box.				
Nani.				

STRENGTH AND RESISTANCE TO STRAINS.

It is not the purpose of this paper to go into the question of the resistance of different woods to different strains. Reference may, however, be made to the tests which have been made of oriental woods.

Skinner, Laslett, Balfour, and Gamble have published the results of tests on Indian timbers. In 1882, Howard Newton published a pamphlet showing the results of some work he had done on the timbers of the Straits Settlements. In 1906, Gardner published a bulletin giving the results of a number of careful tests on thirty different Philippine woods; and in a second edition of this bulletin, published a year later, added information concerning four additional woods. So far as I know, this is the most careful piece of this kind of work which has been done in the east.

ODOR, COLOR, TASTE, ETC.

Many woods have distinct and characteristic odors. Some of them are agreeable—as camphor, sandal, rosewood, etc. There are a few which are distinctly disagreeable, as kulim. The odor of a wood is often a very good means of identifying it; but it is extremely difficult to classify odors.

Color is a variable thing in wood. Usually the heartwood of a given species approximates closely a certain color at maturity; but individuals may not arrive at full maturity. Moreover, in some woods the mature heartwood may have quite a range of color change; and the occurrence or absence of heartwood in some may be a chance variation. Color alone is not often a sufficient means of identification of a wood. Naturally, after weathering, color is of still less value as a means of identification.

A few woods have characteristic taste; thus, *batino* and *dita* are bitter and *pagatpat* is salty.

III. SUITABILITY OF DIFFERENT WOODS FOR SPECIAL PURPOSES.

DURABILITY.

Tests of the durability of a wood are much more severe in the tropics than in the temperate regions because of the high humidity combined with uniform temperature, favoring fungus and bacterial growth and the far greater liability to insect attack. There seem to have been no complete tests made of the durability of any oriental woods; and, in most cases, the only information available for any particular wood is mere hearsay or tradition. There are large series of tests in progress under the direction of the Philippine Forestry Bureau; and these will, in time, clear up much that is now in doubt as to the suitability of special woods for special purposes. In the meantime, much is known in a general way of a number of the woods. The fact that a wood is durable in the temperate zone is no guaranty that it will prove useful in the tropics. Many tropical woods which are not durable in their native country would last very well and be very serviceable if used in a temperate region.

ENEMIES OF WOOD.

Fungus and bacterial growth.—The alternate exposure to moisture and dryness is the condition most favorable to such growth. This condition is found in all woods in contact with the ground—piling, bridge timbers, corner posts of houses, etc. In timbers in contact with the ground, as corner posts of houses, telegraph and telephone poles, fence posts, this condition is most marked at and just above the surface of the ground; and that is the region where decay most quickly takes place.

Dry rot is a form of decay to which some woods are particularly subject. It seems to start in from the end of the wood and may sometimes be prevented by capping the end of the post or beam with good thick paint.

Teredo.—This is a mollusk which bores into many timbers. It thrives in salt or brackish water and destroys piling, boat planking, etc., by boring into it in search of a home. It is exceedingly destructive to a large number of timbers and is the most serious problem in wharf construction.

Termites or *white ants,* known as "anay" or "anay-anay" by Filipinos and Malays, are particularly abundant in the eastern tropics. They attack a wide range of different kinds of wood and it may be doubted if any wood is entirely immune from their attacks. Many of the hard and heavy woods are very resistant to them; but it may be doubted if any of these can entirely resist them without the aid of impregnation. It is often claimed for some particularly hard wood that it is absolutely resistant to the termites; but it will usually be found that it is really only a fortunate chance of location which has prevented the attack.

Beetles.—Numerous small wood-boring beetles cause great destruction among the woods of the tropics. Sapwood is particularly liable to attack; but the heartwood is also liable to attack in many cases. Numerous hardwoods, however, seem to be entirely free from this pest. A number of woods with hard heart and trashy sapwood are regularly cleaned for the market by being felled and left in the forest, sometimes several years, till the beetles and termites have destroyed the sapwood.

In general, the very heavy and very hard woods are those least liable to insect attack. This is, however, not always true; some of the very hard woods are specially liable to the attacks of termites.

From what has been written and what seemed to be generally believed by the trade, the following summary of woods according to their use has been made.

WOODS EXPOSED TO SALT WATER.

Piling.—The use of a wood for piling is the extreme test of durability, principally because of the teredo, which speedily destroys most woods. It is to be doubted if there is any wood which is entirely immune from its attack. A pile presents considerable surface to the air and water alternately, furnishing a condition especially favorable to decay; and

no wood which rots quickly is suitable for piling. The use of sheathed or impregnated woods for piling is fairly common and will doubtless become more so where permanency is desired.

The different mangrove swamp trees are very satisfactory for temporary piling and have been known to last as much as seven or eight years exposed to teredo attack. Their best use, however, seems to be as supports for foundations on swampy or low ground. There seems no reason why they should not last for several hundred years in such places.

Quite another class of piling is used in many places as a support for foundations. The piles are driven down to at least $1\frac{1}{2}$ meters below the surface and are then capped with concrete and a concrete foundation placed on top of them. They are thus protected from the air and are beneath the level of insect work. For such a purpose it is only necessary to select wood strong enough to bear the weight, and otherwise useless woods may be used.

Woods used for piling are:

In the Philippines:

Molave	*Vitex littoralis.*
Aranga	*Homalium* spp.
Agoho	*Casuarina equisetifolia.*
Betis	*Illipe betis.*
Dungon	*Tarrietia sylvatica.*
Dungon-late	*Heritiera littoralis.*
Liusin	*Parinarium griffithianum.*
Mancono	*Xanthostemon verdugonianus.*
Pagatpat	*Sonneratia pagatpat.*
Piagao	*Xylocarpus granatum.*
Tabao	*Lumnitzera littorea.*
Yacal	*Shorea* or *Hopea* spp.

In Borneo:

Bedaru	*Urandra* sp.
Billian	*Eusideroxylon zwageri.*
Kapor	*Dryobalanops* spp.
Merbau	*Intsia bakeri.*
Nibong	*Oncosperma* spp.
Rassak	*Vatica* sp.
Selangan batu	*Shorea* spp.
Taruntum	*Lumnitzera littorea.*

In the Malay Peninsula:

Bedaru	*Urandra* sp.
Billian wangi	*Palaquium obovatum.*
Ballau	*Parinarium oblongifolium.*
Bintangor	*Calophyllum* spp.
Gelam	*Melaleuca leucadendron.*
Kulim	*Scorodocarpus borneensis.*
Malabera	*Fagraea fastigiata.*
Merbau	*Intsia bakeri.*
Penagah	*Mesua ferrea.*
Tampinis	*Sloetia sideroxylon.*
Tembusu	*Fagraea fragrans.*

In India and Ceylon:

Sál	*Shorea robusta.*
Teak	*Tectona grandis.*
Pynkadu	*Xylia dolabriformis.*

Usually the logs are peeled before being used as piles; but occasionally, as in *taruntum* (*Lumnitzera littorea*) and *malabera* (*Fagraea fastigiata*), it seems advantageous to use the log with the bark on it.

Of all known woods the *billian* or Borneo ironwood, is said to be the best and most durable for piling. It is probable that some of the less known woods are equally durable, but they are insufficiently known or do not occur in sufficient quantity to make them of equal importance.

SHIP AND BOAT BUILDING.

Teak (*Tectona grandis*) is the standard by which shipbuilding woods are measured. It stands alone in the first line of Lloyd's Register. Other timbers of this region which are named in Lloyd's are as follows:

Second line:
- Morung saul (*Shorea robusta*).

Third line:
- Angelly (*Artocarpus hirsuta*).
- Thingan (*Hopea odorata*).
- Molave (*Vitex littoralis*).
- Dungon (*Tarrietia sylvatica*).
- Yacal (*Shorea* spp.).
- Mangachapuy (*Hopea acuminata*).
- Betis (*Illipe betis*).
- Ipil (*Intsia bijuga*).
- Guijo (*Shorea guiso*).
- Narra (*Pterocarpus* spp.).
- Batitinan (*Lagerstroemia piriformis*).
- Palo maria de la playa (*Calophyllum inophyllum*).

Fourth line:
- Those of the first and second line when secondhand.

Fifth line:
- Red cedar (*Toona* spp.).
- Banaba (*Lagerstroemia speciosa*).

This by no means indicates that these are the only or even that they are the best shipbuilding woods of the region. It merely means that they have been sufficiently well known to be given a rating. The list should certainly be revised to include a large number of the good woods of the region.

For the keels of boats, a number of the more durable woods are used: *aranga, banaba, bansalaguin, betis, dungon, guijo, liusin, molave, narra, palo maria, yacal, Bassia* spp., etc.

For the planking, *kapor* (*Dryobalanops* spp.), *guijo* (*Shorea guiso*), *thingan* (*Hopea odorata*), *molave* (*Vitex littoralis*).

For the knees, *palo maria, Ceriops* spp., etc.

For masts and spars, the most widely known and used wood seems to be *bintangor* or *poon* (*Calophyllum* spp.).

For small boats, bancas, cascoes, dugouts of various sorts, a large number of the relatively soft, light and easily worked woods are used.

WOODS IN CONTACT WITH THE GROUND.

RAILWAY TIES AND SLEEPERS.

The following woods are used:

In the Philippines:

Molave	*Vitex littoralis.*
Ipil	*Intsia bijuga.*
Acle	*Pithecolobium acle.*
Betis	*Illipe betis.*
Aranga	*Homalium* spp.
Dungon	*Tarrietia sylvatica.*
Yacal	*Shorea* spp.
Tindalo	*Pahudia rhomboidea.*
Sasalit	*Vitex* spp.
Supa	*Sindora supa.*
Anubing	*Artocarpus* spp.
Banaba	*Lagerstroemia* spp.
Bolongeta	*Diospyros pilosanthera.*
Agoho	*Casuarina equisetifolia.*

In Borneo

Pinapok	*Shorea* sp.?
Billian	*Eusideroxylon zwageri.*
Selangan batu	*Shorea* spp.
Resak batu	*Vatica* sp.
Red camphor	*Dryobalanops* spp.
Merabau	*Intsia bakeri.*

In the Federated Malay States:

Chengal	*Balanocarpus* spp.

In India and Ceylon:

Acacia arabica.
Acacia catechu.
Anogeissus latifolia.
Barringtonia racemosa.
Bassia latifolia.
Boswellia serrata.
Calophyllum inophyllum.
Careya arborea.
Cedrus deodara.
Cinnamomum glanduliferum.
Dalbergia latifolia.
Dalbergia sissoo.
Eucalyptus globulus.
Eugenia jambolana.
Hardwickia binata.
Hopea parviflora.
Lagerstroemia parviflora.

In India and Ceylon—Continued.
Melanorrhoea usitata.
Mesua ferrea.
Mimusops littoralis.
Odina wodier.
Pterocarpus marsupium.
Shorea robusta.
Tectona grandis.
Terminalia chebula.
Terminalia tomentosa.
Xylia dolabriformis.

The chief special difficulties which timbers used for railroad ties have to face are conditions of alternate moisture and dryness with exposure to the air and the attacks of termites.

PAVING BLOCKS.

Really very few woods have been fully tested for paving blocks. It seems undesirable to have woods for this purpose which are too hard, because they will become slippery. It seems undesirable also that the blocks should be very greasy. Several Australian woods which have been tried in Manila have not done well. They have lasted less than two years and were really the poorest of any of the woods tried. The best, very much the best, and most satisfactory wood tried here is Philippine *molave* (*Vitex littoralis*). On one of the bridges in Manila there are *molave* blocks that are said to have been in constant hard wear for over thirty years and they are still giving very good service.

The following woods of British India have been recommended for trial as paving blocks: *Pynkado* (*Xylia dolabriformis*), *saj* (*Terminalia tomentosa*), *nagesar* (*Mesua ferrea*), *Lagerstroemia* spp., *Shorea* spp., *Hopea* sp., *Hardwickia* sp., *Soymida febrifuga.*

TELEGRAPH AND TELEPHONE POLES.

Usually the same classes of woods that are suitable for railroad ties will be found to be suitable for this class of work and for fence posts and small bridges or culverts. In the Federated Malay States, *chengal* is quite commonly used for this class of work. In Manila, *ipil* (*Intsia bijuga*) posts are used to carry electric light and trolley wires. *Pagatpat, tindalo* and numerous others are used for telephone poles.

MINING TIMBER.

There is usually not very much care exercised in selecting this, but I have known specially good results to be obtained in the Borneo coal mines from the use of *leban* (*Vitex pubescens*), *kumpas* (*Koompassia* sp.), *billian* (*Eusideroxylon zwageri*), *griting* (*Lumnitzera littorea*), and *resak* (*Vatica* sp.).

CORNER POSTS OF HOUSES.

A very large number of different woods are found which are suitable for this class of work; but only a few of the best are mentioned. In the Philippines: *Molave* (*Vitex littoralis*), *ipil* (*Intsia bijuga*), *acle* (*Pithecolobium acle*), *agoho* (*Casuarina equisetifolia*), *alupag* (*Euphoria cinerea*), *anubing* (*Artocarpus* sp.), *aranga* (*Homalium* spp.), *banaba* (*Lagerstroemia speciosa*), *bansalaguin* (*Mimusops elengi*), *banuyo* (*Wallaceodendron celebicum*), *batitinan* (*Lagerstroemia batitinan*), *betis* (*Illipe betis*), *calamansanay* (*Nauclea* sp.), *dungon* (*Tarrietia sylvatica*), *dungon-late* (*Heritiera littoralis*), *liusin* (*Parinarium griffithianum*), *macaasin* (*Eugenia* spp.), *mancono* (*Xanthostemon verdugonianus*), *mangachapuy* (*Hopea acuminata*), *narra* (*Pterocarpus* spp.), *palo maria* (*Calophyllum inophyllum*), *sasalit* (*Vitex aherniana*), *supa* (*Sindora supa*), *tamayuan* (*Strombosia philippinensis*), *tucan-calao* (*Aglaia clarkii*), and *yacal* (*Shorea* spp.).

The list would be so long if completed for all the different countries that it seems best to leave it to the notes on the individual species.

FURNITURE AND ORNAMENTAL WOODS.

Woods with brilliant color and pretty grain and capable of taking a high polish are particularly numerous in this region.
These may be classified by color:

Black, dark-brown or purplish woods:

Ebony (*Diospyros* spp. and *Maba* sp.). Ceylon; India; Malay Archipelago.
Coromandel wood (*Diospyros quæsita* and other species). Ceylon.
Camagon (*Diospyros discolor* and other species). Philippines.
Bolongeta (*Diospyros pilosanthera*). Philippines.
Rosewood or blackwood of India (*Dalbergia latifolia*). India.
East Indian walnut (*Albizzia procera*). India and Philippines.
Sissu (*Dalbergia sissoo*). India.
Black wattle (*Acacia melanoxylon*). Planted in India.
Mirabow (*Intsia bakeri*). Malay Peninsula and Archipelago.
Ipil (*Intsia bijuga*). Seacoast forest throughout the whole region.
Cay-go (*Sindora cochinchinensis*). Eastern Cochin China.
Anjan (*Hardwickia binata*). India.
Tapang (*Koompassia excelsa*). Borneo.
Batitinan (*Lagerstroemia piriformis*). Philippines.
Acle (*Pithecolobium acle*). Philippines.
Catmon (*Dillenia* spp.). Philippines.
Teak (*Tectona grandis*). India; Java; Siam.
Supa (*Sindora supa*). Philippines.
Dalinsi (*Terminalia* sp.). Philippines.
Lanutan (*Bombycidendron vidalianum*). Philippines.
Pynkadu (*Xylia dolabriformis*). India.
Siris (*Albizzia julibrissin*). India.
Coconut (*Cocos nucifera*). Seacoasts everywhere.
Tamarind (*Tamarindus indica*). Widely cultivated.

Black, dark-brown or purplish woods—Continued.
Wa (*Cassia siamea*). Ceylon; India; Malaya.
Nedun (*Pericopsis mooniana*). Ceylon.
Palo maria or Bitaog (*Calophyllum inophyllum*). Seacoasts everywhere.
Banuyo (*Wallaceodendron celebicum*). Celebes; Philippines.
Dhaura (*Anogeissus latifolia*). India.
Jhand (*Prosopis spicigera* L.). India.
Red or reddish woods:
Tindalo (*Pahudia rhomboidea*). Philippines.
Narra (*Pterocarpus* spp.). India and Philippines.
Calamansanay (*Nauclea* spp.). Philippines.
Lumbayao (*Tarrietia javanica*). Philippines and Java.
Tanguile (*Shorea polysperma*). Philippines.
Pennagah (*Mesua ferrea*). India and Malaya.
Bintangor (*Calophyllum* spp.). Borneo; Malaya; India.
Gerunggang (*Cratoxylon* spp.). Borneo.
Renghas or Borneo redwood (*Melanorrhea* and *Swintonia* spp.). Borneo and Malaya.
Nireh (*Xylocarpus* spp.). Mangrove swamps, India to the Philippines.
Kranji (*Dialium* spp.). India; Malaya; Borneo; Sumatra; etc.
Red sanders (*Pterocarpus santalinus*). India.
Coral wood (*Adenanthera pavonina*). India and Malaya.
Banaba (*Lagerstroemia speciosa*). India and the Philippines.
Chittagong wood (*Chukrassia tabularis*). India.
Umbrella tree (*Thespesia populnea*). Ceylon to the South Sea Islands.
Indian almond (*Terminalia catappa*). India to the Philippines.
Bansalaguin (*Mimusops elengi*). India to the Philippines.
Toon (*Toona* spp.). India and the Philippines.
Cedar, pink or red (*Acrocarpus fraxinifolius*). India.
Jambolana (*Eugenia jambolana*). Widely planted.
Kaddam (*Stephegyne parvifolia*). India.
Mahogany (*Swietenia mahagoni*). India (planted).
East Indian mahogany (*Soymida febrifuga*). India.
Margosa (*Azadirachta indica*). India.
Oak, Indian (*Barringtonia acutangula*). India.
Stereospermum spp. India.
Sandan (*Ougeinia dalbergioides*). India.
Serayah (*Hopea* or *Shorea* spp.). Borneo and Malaya.
Bastard teak (*Pterocarpus marsupium*). India.
Thitka (*Pentace burmanica*). India.
Red lauan (*Shorea* sp.). Philippines and Borneo.
White or yellowish woods:
Boxwood (*Buxus sempervirens*). India.
Agaru (*Chisocheton* sp.). Philippines.
Bedaru (*Urandra* sp.). Borneo and Federated Malay States.
Bancal (*Sarcocephalus cordatus*). India and the Philippines.
Nangca (*Artocarpus integrifolia*). India; Ceylon; Java; Philippines.
Anubing (*Artocarpus cumingiana*). Philippines.
Sacat (*Terminalia nitens*). Philippines.
Camuning (*Murraya exotica*). Malaya and the Philippines.
Cayutana (*Fagara* sp.). Philippines.
Lanete (*Wrightia* spp.). Philippines.
Molave (*Vitex littoralis*). Philippines.

White or yellowish woods—Continued.

Catinga (*Citrus* sp.). India and Malaya; widely planted.
Champaca (*Michelia champaca*). Widely planted.
Camphor wood (*Cinnamomum camphora*). Formosa and Ceylon.
Sandalwood (*Santalum* spp.). India to South Sea Islands.
Snakewood (*Strychnos nux-vomica*). India.
Satinwood (*Chloroxylon swietenia*). India and Ceylon.
Canary wood (*Morinda citrifolia*). India and planted elsewhere.
Deodar (*Cedrus deodara*). India.
Chatwan (*Alstonia scholaris*). India to the Philippines.
Haldu (*Adina cordifolia*). India to the Philippines.
Santol (*Sandoricum indicum*). India to the Philippines.
Yellow sanders (*Ximenia americana*). India to the Philippines.
Culis (*Memecylon edule*). India to the Philippines.

CARVING AND WOOD ENGRAVING.

For wood engraving and instruments of precision boxwood is unequaled. In the manufacture of small articles, rulers, etc., ebony is often used because of its freedom from shrinking.

For carving, *lanete* (*Wrightia* spp.), *molave* (*Vitex littoralis*), *teak* (*Tectona grandis*), and *sandal* (*Santalum album*) seem most in favor. A number of other woods are used, one of them, the blackwood of India (*Dalbergia latifolia*), being used in considerable quantity for the manufacture of carved furniture.

TOOL HANDLES.

This kind of work requires a wood which is dense and of even grain and which will turn well.

Some of the woods most used are *Mimusops elengi, Psidium guajava, Memecylon edule, Murraya exotica, Mesua ferrea, Shorea obtusa, Eugenia tetragona, Dodonaea viscosa, Xylocarpus* spp., bamboos, etc.

CANES OR WALKING STICKS.

This requires a wood which is pretty, close-grained and capable of finishing well.

The species most used are *Balanites roxburghii,* various bamboo and palm stems, *Cassia siamea, Dichrostachys cinerea, Diospyros discolor, Diospyros pilosanthera, Diospyros* and *Maba* spp., *Dodonaea viscosa, Grewia populifolia, Murraya exotica, Parrotia jacquemontiana, Prinsepia utilis, Pterocarpus* spp., *Pahudia rhomboidea, Sarcococca pruniformis, Zanthoxylum alatum, Taxotrophis ilicifolia.*

BOXES OR PACKING CASES.

Almost any wood which occurs in quantity, is easily worked and not too hard and heavy may be used for this purpose. In places, special industries have made it necesary to use large quantities of wood for boxes. Thus, in Ceylon, the tea industry has required a great number of cases. Mr. F. E. Lewis had a very interesting article on the tea-

box woods of Ceylon in the Trop. Agric. **18**: 307–310, in which he listed the woods used for that purpose in Ceylon. In Borneo, the cutch companies have found that common grades of *seriah* are well suited for the manufacture of the packing cases in which they ship their product. In the Philippines, the wood of *cupang* (*Parkia roxburghii*) has been found to be very satisfactory for packing cases.

BARRELS AND COOPERAGE STOCK.

For loose barrels, much the same materials as for boxes may be used, if strong enough. Tight cooperage stock, however, is a much more difficult proposition. There are plenty of woods in this region which are strong enough and which will make tight enough barrels, but they are usually highly colored and will give up their color readily. Thus far, I know of no tropical wood which is the equal of white oak for this purpose. This is a subject which needs to be worked up, as either the barrels or the material to make them now have to be imported from Europe or America.

MATCH WOODS.

Where the soft coniferous woods of the temperate regions are not available, it is somewhat difficult to get really good match woods. A few of the tropical woods are satisfactory. The following are used at Manila: *Malapapaya* (*Polyscias nodosa.*) which is much the most satisfactory both for the boxes and the sticks; *teluto* (*Pterocymbium tinctorium; pincapincahan* (*Oroxylum indicum*); and *cupang* (*Parkia roxburghii*). Besides these, the wood of *Ganophyllum falcatum,* found in the Philippines, New Guinea, Australia, and Java, is said to be very good.

PAPER PULP.

Thus far the making of paper pulp has not become an important industry in this region; but, with the increasing scarcity of wood for pulping purposes in other regions, it is bound to become important. Thus far, we know that various ones of the soft dipterocarps, as well as several other woods, are well suited for this kind of work. There are probably a number of woods which occur in some quantity in the region which are worth investigating for this purpose.

DYEWOODS.

A number of the highly colored woods are useful as dyewoods. Examples of these are *sibucao* (*Caesalpinia sappan*), which furnishes a red or yellow dye; red sanders (*Pterocarpus santalinus*) and other species of *Pterocarpus,* which furnish red dyes; *Adenanthera pavonina,* a yellow or brownish dye; *ipil* (*Intsia bijuga*), a brown dye; some species of *Terminalia,* yellow dye; *tangal* (*Ceriops* spp.), yellowish-red dye.

The dyewoods are not of very great commercial importance, but they are used locally to a considerable extent.

IV. RARE ORNAMENTAL OR PRECIOUS WOODS.

Under this heading it is intended to include those woods which have a special popular interest aside from their commercial value. The principal ones of these are boxwood, camphorwood, corkwood, ebony, incense wood, ironwood, lignum-vitæ, mahogany, rosewood, sandalwood, satinwood, and zebrawood.

BOXWOOD.

This is produced by *Buxus sempervirens* L. (see p. 487) and is the best wood in the world for wood engraving. No thoroughly satisfactory substitute has been discovered. One of the best substitutes is a related African species of the same genus. The following list of woods which are sometimes used as substitutes for boxwood or which might be of service as such is given by Watt:

Atalantia monophylla.
Crataeva religiosa.
Celastrus spinosus.
Chloroxylon swietenia.
Dodonaea viscosa.
Gardenia gummifera.
Gardenia latifolia.
Hemicyclia sepiaria.
Homonoia symphylliaefolia.
Ixora parviflora.
Memecylon edule.
Murraya exotica.
Olea ferruginea.
Psidium guajava.
Punica granatum.
Santalum album.
Sonneratia acida.
Viburnum erubescens.

To this list might be added *Clausena excavata* Burm., *Aegle marmelos* Corr., *Fagara* spp. of the *Rutaceæ,* and a number of fine and even-grained *Rubiaceae.*

Stevenson 124–130; Holtzapffel 76; Watt Dict. 1:557; Boulger 147; Wiesner 2:962.

CAMPHORWOOD.

The camphorwood of Japan and Formosa is the product of *Cinnamomum camphora* Fr. Nees & Eberm. (see p. 454). All parts of the wood contain a considerable amount of the gum or oil and have a very pronounced odor of camphor. The wood is easy to work, polishes well and is much used in the manufacture of chests, drawers and insect-proof cases. The demand for such articles is so great that the makers find it difficult to get enough wood for their work. The cabinetmakers in Manila make a great many imitation camphorwood chests. Various soft, cheap woods, as white lauan, are used, after being first treated with oil to give them an odor like camphorwood. The imitation camphorwood chests are, naturally, not so durable as those made from the true camphorwood. After the effect of the oil with which they were treated wears off, they are likely to be attacked by insects.

Nepal camphorwood, produced by *Cinnamomum glanduliferum* Meissn., of British India, has brown tough wood with the odor of sassafras and is also used for cabinet work.

A number of other members of the family *Lauraceæ* produce wood

which has a strong odor of sassafras. Different ones of these are known as *kappla, ruan, medang lada* and *caliñgad* in the Malay Archipelago. It is probable that some of these at any rate would make good substitutes for camphorwood in the manufacture of insect-proof boxes.

The *Borneo camphorwood* is obtained from species of *Dryobalanops* (see p. 509), of the family *Dipterocarpaceæ,* and does not have an odor like camphor, except in the neighborhood of the camphor deposits. This wood is not used for cabinet work.

Holtzapffel 87; Boulger 153.

CORKWOODS.

A number of plants, from widely different families, and mostly tropical, are found to produce what is known as corkwood; i. e., a wood which more or less resembles true cork in its physical properties.

These woods show differences in structure but agree in having very thin-walled elements, which are empty or filled with air in the dry wood. These uniformly thin-walled elements cause the wood to have a very low specific gravity and to be exceedingly soft.

Very uniform corkwood is produced by *Ceiba pentandra* (L.) Gaertn. and *Bombax malabarica* DC. *Alstonia scholaris* (L.) R. Br. furnishes another type of corkwood. The structure is varied by numerous fine parallel concentric lines of wood parenchyma. *Erythrina indica* Lam. and other species have corkwood of a quite different type—wide concentric belts of wood parenchyma having between them rather narrow belts of denser tissue. The vessels are also rather large. Still another type of corkwood is that furnished by the roots of *Sonneratia pagatpat* Blanco and other species. Here the wood is very homogenous in structure and very like a fine white cork. Some other woods which furnish corkwood from their stems or roots are *Tetranthera amara* Nees, and species of *Xylopia, Anona, Hibiscus, Dyera,* etc.

The corkwoods are commonly used as floats for fishing nets and as material for the manufacture of the crude carvings so common among wild tribes in Borneo.

Wiesner **2:** 1020–1023; Blits 51; Winton 253–255.

EBONY (see p. 543).

INCENSE WOODS.

Certain woods are valued because of their ability to produce a pleasant odor when burned. Several of these have, since the most ancient times, been employed in religious ceremonies. The best known of these is *Santalum album* L., mentioned in the Hebrew Scriptures as *algum* or *almug.*

The *lign aloes* or *lignum aloes* of the Scriptures is the same as the *eaglewood* of commerce and is produced by *Aquillaria agallocha* Roxb. (*Aloexylon agallochum* Lour.), and other related species, of India and Malaya.

The different incense woods of the Malay region are usually known as *kayu garu.* Besides those mentioned, there are various species of *Gonystylus* quite widely known and used.

A comparatively local incense wood is the *kayu laka,* which is obtained from the roots of *Dalbergia cumingiana* Benth., in Borneo. It is used maïnly in China.

Besides the incense woods already named, there are a number of more or less local importance. Some of these are *Wikstroemia candolleana* Meissn., *Excoecaria agallocha* L., *Canarium* sp., *Alyxia stellata* R. & S., *Epicharis loureiri* Pierre, *Lepiaglaia bailloni* Pierre, etc.

Boorsma, G. W. Ueber Aloëholz und andere Riechhölzer.—Bull. Dept. Agric Buitenzorg 7 (1907) 1–43. Ridley, H. N.; Garu and chandan.—Journ. Straits Branch Asiat. Soc. 35 (1901) 73–82; Flükiger-Pharmakognosie 216.

IRONWOOD.

This name or its equivalent is found applied to a number of different woods on account of their hardness; and any wood of conspicuous hardness is liable to be called by this name. Nearly all the ironwoods, and about eighty are known, have other local names, the name ironwood having evidently been introduced after the advent of English-speaking people. Usually the wood is extremely hard, dense and dark-colored and sinks in water.

A list of the ironwoods of this region follows:

1. Billian or Borneo ironwood (*Eusideroxylon zwageri* T. & B.). Found in Borneo and Sumatra. (See p. 452.)
2. Agoho or kayu ru (*Casuarina equisetifolia* Forst.). Seacoasts throughout the whole region. (See p. 444.)
3. *Casuarina montana* Jungh. Java and Borneo.
4. Ru ronan (*Casuarina sumatrana* Jungh.). Malaya. (See p. 444.)
5. Tampinis (*Sloetia sideroxylon* T. et B.). Federated Malay States and Straits Settlements; Borneo. (See p. 447.)
6. *Cryptocarya ferrea* Bl. Java.
7. Nagesah (*Mesua ferrea* L.). Ceylon; India; Malaya. (See p. 505.)
8. *Aglaia minahassae* T. et B. Celebes. (See p. 477.)
9. *Dodonaea* sp. Seacoasts. (See p. 493.)
10. *Cupania lessertiana* Cambess.
11. *Homalium foetidum* Benth.
12. Kayu besi (*Metrosideros vera* (Rumph.) Niedenzu). Moluccas to China. (See p. 535.)
13. Mancono (*Xanthostemon verdugonianus* Naves). Philippines. (See p. 536.)
14. Ipil (*Intsia bijuga* (Colebr.) O. Ktze.). Seacoasts. (See p. 461.)
15. Mirabow (*Intsia bakeri* Prain). Malaya. (See p. 461.)
16. *Baryxylum rufum* Lour. Cochin China.
17. *Acacia farnesiana* Willd. Tropics. (See p. 470.)
18. *Acacia ferruginea* DC. East Indies. (See p. 470.)
19. Pynkadu (*Xylia dolabriformis* Benth.). India. (See p. 463.)
20. *Imbricaria maxima* Poir. Moluccas.
21. *Sideroxylon nitidum* Bl. Java.

22. *Sideroxylon tomentosum* Roxb. Coromandel. (See p. 542.)
23. *Sideroxylon ferrugineum* Hook. et Arn.). Tropical Asia. (See p. 542.)
24. Arang (*Maba buxifolia* Pers.). India to Philippines. (See p. 547.)
25. Anan (*Fagraea fragrans* Roxb.). (See p. 549.)

Boulger 191; Holtzapffel 88.

LIGNUM-VITÆ.

True lignum-vitæ does not occur outside of the tropical American region. It is the product of species of *Guajacum* and is of rather restricted range. It was first introduced into Europe by the Spaniards at about the end of the fifteenth century and has been very much in demand ever since. It is exceedingly hard and heavy. Its specific gravity varies between 1.17 and 1.39 and it is often credited with being the heaviest of all known woods. The fibers are very twisted and, as a consequence of this, it is extremely difficult to split the wood. It is very much used for bowling-alley balls, sheaves of pulleys, rollers, policemen's batons, and as bushing for propellers in salt water craft. It seems likely that the supply will approach exhaustion before long, and it is highly desirable that some satisfactory substitute be secured.

Some of the woods which have been tried as possible substitutes are *mancono* (*Xanthostemon verdugonianus* Naves) of the Philippine Islands; *Dodonaea viscosa* L., a widely distributed seacoast wood usually of small size; *Calophyllum inophyllum* L., another widely distributed seacoast plant, which has a very twisted grain and which is sometimes used for bowling balls.

Mancono (*Xanthostemon verdugonianus* Naves), of the Philippine Islands, is probably the best known and most thoroughly tested of the substitutes for lignum-vitæ. It is of much the same weight and is harder than lignum-vitae. It is of crooked grain and difficult to split. It seems to be immune to the attacks of termites and teredo. It has been tried in various places where it was subject to abrasion and to droppings of water and oil and has proved very satisfactory. The following test of *mancono* was made at the United States naval station, Cavite, Philippine Islands: "The wood was installed on side grain, as a bearing for journals rotating in salt water, in the stern bushing of a small launch which was in constant use. At the end of seven months the bearing was split out for examination. The wood was found to be but little worn, and was reported by the commander of the naval station to be 'quite the equal of lignum-vitæ, when both are used for bearings on the side grain.'"

It seems probable that, for several purposes, *mancono* is as serviceable as lignum-vitæ and a very satisfactory substitute for that wood.

Hutchinson, W. I. A Philippine substitute for lignum-vitae. Bureau of Forestry (Philip.) Bull. **9** (1908) 1–8; Stone 18–21; Wiesner **2**: 950–952; Holtzapffel 90; Boulger 202.

MAHOGANY.

True mahogany does not occur in nature in the Orient. It is the product of *Swietenia mahagoni* L. and is found only in tropical America. It was introduced into Europe by the Spaniards in the sixteenth century. Since the middle of the eighteenth century it has been the most used and valued of cabinet woods. The much prized Chippendale and Sheraton chairs of the eighteenth century were made of this wood. The continual demand for this wood for piano cases, fine furniture, cabinet work, etc., has caused it to become scarce and high in price, and efforts have been made to substitute other woods for it. More than twenty substitute or imitation mahoganies are known, and some of them are such good woods that they could probably secure a good market under their own proper names. The true mahogany and the closely related *Swietenia macrophylla* King have done well in plantations in India (Gamb. 154). Young trees of both have also shown a fine rate of growth wherever tried in the Philippines. It is not improbable that these two species may some day be of commercial importance as plantation crops in this part of the world.

The best of the substitute mahoganies belong to the subfamily *Swietenioideæ*, the "mahogany subfamily" of the *Meliaceæ*. The following members of this subfamily are worthy of note:

Khaya senegalensis A. Juss. (*Swietenia senegalensis* Desv.). This is called *African mahogany* and has supplied a large part of the mahogany on the European and American markets for the last twenty years (Kew Bull. Misc. Inf. 1890, 168–170). Other species are also called African mahogany. The wood is lighter in color than the original mahogany and is also inferior to that wood in hardness and grain. However, it is very variable and pieces are found which are darker reddish-brown than the true mahogany.

Soymida febrifuga A. Juss. (*Swietenia febrifuga* Willd.), found in British India and Ceylon, known as *East Indian mahogany*. This is a very hard and very heavy wood, heavier than true mahogany and dark-red in color. It would be of great commercial importance if it could be produced in sufficient quantity.

Chukrassia (*Chickrassia*) *tabularis* A. Juss. (*Swietenia chickrassia* Roxb.). *East Indian mahogany* or *Chittagong wood*.—British India and Ceylon, Burma and southern China. This is not so hard nor so heavy as the preceding. It would probably be of importance if found in greater quantity.

In the subfamily *Cedreloideæ* of the *Meliaceæ*, there are a number of species in the genera *Cedrela*, of the West Indies, and *Toona*, of the East Indies, which produce odorous wood known as cedar and sometimes called mahogany. The *toon* of India, *Toona serrata* (Royle) Roemer, is sometimes called Indian mahogany and the *calantas*, *Toona calantas* Merr. & Rolfe, of the Philippine Islands, has sometimes been called *Philippine mahogany*. They are more often and more correctly known as *cigar-box* woods.

Besides those already mentioned, there are in the East several so-

called mahoganies which do not have any close relationship to the true mahogany, except, perhaps, that of color. Some of these are:

Padouk, Andaman redwood, narra, Philippine mahogany. This is the product of various species of *Pterocarpus.* It is a very choice furniture wood, but it is, of course, not a mahogany. It does not need to be called a mahogany to find a market.

Penagah, Palo maria, Bitaog, or *Borneo mahogany* (*Calophyllum inophyllum* L.). This wood does not closely resemble mahogany. It is, in some respects, superior to that wood.

The *tanguile* of Negros, a soft, red-wooded dipterocarp, has been sold in some places as Philippine mahogany. It is found to be a satisfactory substitute for mahogany in interior finish such as show windows, panels, and bank furniture. It should be suitable also for piano cases and good furniture.

Wiesner 2: 958–962; Stevenson 225–249; Holtzapffel 91; Boulger 206–210; Stone 32–35.

POISONOUS WOODS.

Occasionally there are rumors of woods which contain sufficient of a poisonous principle to cause them to be injurious to whoever handles them. Such reports are usually found to be inaccurate, the poisoning being done by other parts of the plant.

The principal poisonous woods of this part of the world are a few *Anacardiaceæ* which cause a skin irritation similar to that produced by the "poison ivy" and "poison oak" (*Rhus* spp.) of temperate regions. These woods are produced by species of *Gluta, Holigarna, Melanorrhoea. Semecarpus,* and *Swintonia;* and they usually are known by the name of *"ringhas"* in the Malay region.

When seasoned, the wood is much less likely to cause poisoning than when fresh. The seriousness of such poisoning is often exaggerated, and many persons are entirely immune to this class of poisoning.

Besides the woods mentioned, that of *Excoecaria agallocha* L., the "eye-blinding plant" of India, is of evil repute. The wood contains an extremely acrid dark-colored gum which is very irritant in contact with the skin and is said to cause blindness if rubbed on the eyes. It is said that the coolies who work this wood for charcoal suffer a great deal from the effects of the fumes of the burning wood.

ROSEWOOD.

Rosewood is a term as generally applied as ironwood and to almost as great a variety of plants in different parts of the world. There are something more than thirty different rosewoods. Most of them have heavy, dark-colored woods and quite a number belong to the *Leguminosæ,* in such genera as *Dalbergia* and *Pterocarpus.* Some of them contain a fragrant resin or oil, from which the name has originated. They have nothing more to do with the rose.

Much of the rosewood of commerce comes from Brazil and is said to be the product of *Dalbergia nigra* Allem. and related leguminous species; but members of other families also produce true rosewood.

The East Indian rosewood is the product of *Dalbergia latifolia* Roxb. and *Dalbergia sissoo* Roxb. (See p. 465.) Another of the Indian rosewoods is the *padauk, Burmese rosewood* or *narra,* which is the product of *Pterocarpus indicus* Willd. and other species of *Pterocarpus.* The rosewood of the Seychelles is *Thespesia populnea* Corr. (See p. 499.) In some portions of India a certain species of *Millettia* is said to furnish small amounts of rosewood. *Cordia myxa* L., a small tree of tropical Asia and Australia, is said to furnish small amounts of rosewood. The *Borneo rosewood* or *renghas* is a beautiful red- and purple-streaked wood, which makes beautiful furniture. It is the product of various species of *Melanorrhoea* and *Swintonia.* (See p. 489.)

The woods known as *kingwood* or *violet wood* are special kinds of rosewood, probably from species of *Dalbergia* and best known under these names, from Madagascar and South America.

Wiesner 2: 1017, 1014; Stevenson 264; Holtzapffel 103; Boulger 263; Stone 62–64.

SANDALWOOD.

The white or yellow sandalwood is produced by *Santalum album* of India and Malaya. Other related species and genera in Australia furnish very good substitutes for it. The sandalwood of the Fiji Islands is produced by *Santalum freycinetianum* Gaud. and other species.

Exocarpus latifolia R. Br. which is said to produce a sandalwood in Australia extends as far north as the Philippines; but it is usually of very small size here and I have not known it to produce sandalwood.

The name *chandana* or *sandana* seems to be very generally used to indicate various kinds of sandalwood; but it is probable that the name is also applied to other woods which are more or less odorous. In the Philippines, the term *sandana* is known and is said to indicate an odorous wood; but, thus far, I have been unable to definitely find sandalwood produced in the Islands. In British North Borneo the term is also found, but sandalwood is surely very rare, if it occurs there at all. The red sandalwood or red sanders of India is the product of *Pterocarpus santalinus* L., and *Adenanthera pavonina* L.

Dysoxylum loureiri Pierre (*Epicharis loureiri* Pierre) and *Lepidaglaia baillioni* Pierre (*Epicharis baillioni* Pierre) are two species of meliaceous wood growing in Cochin China and forming large trees, the timber of which is used for ornament, while the oil derived from it is used for medicinal purposes. When rubbed or burnt it emits an odor of sandalwood, on which account it is employed as incense in the temples.

Trop. Agric. 1 (1882) 800; Pierre, For. Fl. Coch. China. 358; Jumelle 338.

In India, sandalwood is largely used in the manufacture of boxes, fans, and other ornamental articles of inlaid work, and to a limited extent in medicine as a domestic remedy for all kinds of pains and aches. The oil is largely used as a perfume, few native attars or essential oils being free from admixture with it. In the form of powder or

paste the wood is employed by the Brahmans for their distinguishing caste marks.

The *bastard sandalwood* of India is *Erythroxylon monogynum* Roxb. It is very fragrant and is used as a substitute for sandalwood. The *yellow sanders* (*Ximenia americana* L.), of tropical America, the Pacific Islands, Malaya, Australia, Asia and Africa, has a fragrant yellow wood which is used as a substitute for sandalwood.

Holtzapffel 105; Wiesner 2: 908–911; 937–940. Boulger 266–268; Stone 191.

SATINWOOD.

This is the product of *Chloroxylon swietenia* DC. (See p. 473.) It is found in India and Ceylon, where it has been rather common. Certain species of *Fagara, Zanthoxylum,* etc. are also known to produce satinwood in tropical America and Australia. Certain Philippine *Rutaceæ* have wood which would do very well as a satinwood, but they are usually of comparatively small size and rather scattered in occurrence. The name refers to the beautifully smooth and satiny luster which the wood shows when finished. This wood was probably introduced into Europe before mahogany. It was in request for rich furniture about the end of the eighteenth century, the fashion then being to ornament panels of it with painted medallions and floral scrolls and borders. Now it is used for inlaying or borders and small veneers and most largely in covering the backs of hair and clothes brushes and in making small articles of turnery, all kinds of furniture, railway carriages, writing and stationery fitments and toilet requisites.

Maba buxifolia Pers. is said to furnish a kind of satinwood, but I have never seen it so used.

There is frequently a curled grain which adds to the beauty.

Holtzapffel 105; Stevenson 267; Stone 29–31; Wiesner 2: 953; Boulger 281.

ZEBRAWOOD.

This is a name given to varieties of wood used as veneers, and striped so as to suggest a zebra's skin. The name has been used for some of the bright-streaked species of *Diospyros* and also for some woods which occur in small size and which have a conspicuously variegated appearance with bright colors. Such woods seem to be of little importance except for canes and other small articles.

One of the trees said to produce zebrawood in South America is *Guettarda speciosa* L. This same tree is not uncommon along the sea-coast in this part of the world, but it seems usually to be of rather small size and but little used.

Another Philippine wood to which this name would seem to apply is *Taxotrophis ilicifolia* Vid. This wood is brilliantly streaked and makes most striking canes.

Holtzapffel 110; Boulger 302.

CHART OF COMMERCIALLY EQUIVALENT WOODS.

[Members of the *Dipterocarpaceæ* are indicated by **black-faced** type.]

Philippines.	Federated Malay States and Straits Settlements.	British North Borneo.	Sarawak.	Dutch Borneo and Netherlands Indies.	Cochin China.	Burma.	British India.	Ceylon.
Acle			Ringa		Cam-xé	Pyingadu	Jambu	
Acleng-parang				Ki-riang		Sit	Siris	Mara.
Agaru	Gerontang tengah							
Agoho	Ru	Ru	Ru	Aij-samara		Tinyu	Chouk	
Alupag	Rambutan		Rambutan	Lungsir / Bedaroh		Kyetmouk	Asphal	Rasmora.
Amuguis				Djaran		Nabé	Kiamil	Hik.
Antipolo	Nangka	Jack	Nangka	Ambi		Peinne	Kanthal	Kos.
Anubing	Kledang		Mentawa	Ambi		Taungpeinné	Chaplash	Kanagona.
Api-api	Appi-appi	Appi-appi	Appi-appi	Api-api		Thamé	Bani	
Apitong	**Krewing**	**Kruen**	**Kruen**	**Tampoedouw**	**Dau-con-rai**	**Eng**	**Gurjun**	**Hora.**
Aranga	Petaling ayer / Pantat ulat puti			Kayu poris		Myaukchaw		Liyan.
Bacauan	Bako	Bako	Bakao	Bako		Pyu	Bhara	Kadol.
Balacat	Bedara china			Balis-bukkol		Zi	Kul	Maha-debara.
Balinhasay	Rengas of poor quality.		Teringtang chiit	Ingas-burung		Lonbo	Kurku	Sara.
Banaba	Bongoh		Bongoh	Benger		Pyinma	Jarul	Muruta.
Banalo	Baru waru laut						Parsipu / Poris / Portia	Suriya.
Bancal			Silimpó	Kayu-mas		Ma-uletanshe	Vammi	Bakmi.
Bani-bani	Kachang kayu laut. / (Malapari)		Bansu			Thinwin	Ponga	
Bansalaguin	Poko tanjong			Bunga tanjong		Kaya	Bukal	Munamal.
Banuyo				Mawewek				

Batete						Kolávu		
Baticulin	Medang	Medang	Medang	Madang	Ondon	Meda lakri	Bombi.	
Batitinan					Leza			
Batino								
Betis	Belian		Nyatto pisang					
(Tambulian?)	Billian	Billian	Billian	Oelin Ulin Eijserhout				
Bitanhol	Bintangor	Bintangor	Entangor	Bintangor	Pantaga	Poon	Kina.	
Bolongeta			Kayu malam					
Calamansanay	Pulasan utan							
Calantas	Suntang puti			Alossul	Thitkado	Toon		
Calumpit				Kloempit				
Camagon	Kayu malam	Kayu malam	Kayu malam				Calamander. Coromandel.	
Camuning	Kamuning	Kamuning	Kamuning	Kamuning	Thanatka	Kamini	Etteriya.	
Catmon	Simpor		Simpor		Thabyu	Chalta.	Hondapara.	
Cato					Thitni	Rohituka		
Cayutana	Catinga							
Cupang	Gudayong Kadayong Kurayong		Gudayong Kadaong Kurayong	Gudah		Sapota		
Dao	Bengkuang			Dao Buwa-rau				
Dita	Pulai	Plai	Plai	Pulei	Taungmeok	Chatwan	Rukattana.	
(Anan) Dolo (Teca)	Tembusu			Ki-badak		Anan		
Duguan	Piango		Cumpang	Bawang	Maloh	Kanagi		
Dungon-late	Dungon	Dungun	Dungun	Dungun	Pinlikanayo	Sundri	Etuna.	
Ebony	Kayu arang	Kayu arang	Kayu arang	Kayu arang		Ebony	Kalwara.	
Guijo		**Selangan Batu Mireh.**			**Sal**			
Ipil	Merbau	Mirabow	Merbau paya	Merbau	Pyingadu	Shoondul		

Chart of commercially equivalent woods—Continued.

Philippines.	Federated Malay States and Straits Settlements.	British North Borneo.	Sarawak.	Dutch Borneo and Netherlands Indies.	Cochin China.	Burma.	British India.	Ceylon.
Kapor	**Kapor**	**Kapor**	**Kapor**	**Kapor**, **Kamferhout**				
Lanete				Bientaus		Lettokthein	Dudhi	
Langaray	B'rus	B'eus	B'rus	B'eus, Kajoe-soesoe				
Red Lauan	**Meranti**	**Seriah Merah**	**Meranti**	**Seriah Merah**				
White Lauan	**Meranti**	**Seriah Puti**	**Meranti**	**Meranti**				
Liusin	Merbatu layong, Ballow, Johore teak							
Lumbayao				Ki-manuk				
Macaasin	Klat, Kelat jambu		Ubar	Djambu		Thabyebyu	Chambu	Mahadan.
Malapapaya								
Malugay	Kasai					Thabyay	Badoh	Galmosa.
Mancono				Kayu besi benar				
Mangachapuy	**Chengal** (2)	**Gagil** (1)	**Gium**, **Tekam**	**Kationgan**				
Mangasinoro		**Seriah Puti**		**Bangkirai**				
Mayapis	**Mersawa**		**Meraca ?**	**Basoeng**		**Thinkadu**		
Molave								
Calipapa, Molauin aso, Leban	Leban	Leban, Halban, Calipapa	Leban, Calipapa	Haleban, Calapapang		Kyetyo	Myladi	
Narig	**Ressak**	**Resak**	**Rassak**	**Rassak**				
Narra	Angsana		Angsana	Angsana		Padauk	Andaman redwood.	Gammala.
Nato	Niato		Nyatto	Njattoe				

Nigue	Niri	Niri	Niri	Niri		Pinleon	Poshur	
Pagatpat	Perupat	P'rapat	P'rapat	P'rapat		Tabyu	Keowra	
Pedada	Bedata		Pedada	P'dada				
Pagsainguin	Kadongdong hutan.							
Palo maria de la playa.	Penagah	Penaga	Pennagah	Penagah		Ponnyet	Puna	Domba.
Bitaog								
Piagao	Niri	Niri	Niri	Niri (Boeli-boeli)				
Pototan	Tumu	Lengadi (?)	Putut	Akat	Cay day		Kahra	
Saleng						Tinyu	Dingsa	
Santol	Sintol		Sintol	Aijulet		Thitto		
Sudjung								
Supa	Saputi?		Petir	Sapetir				
Talisay	Katapang		Catapang	Katapang			Badam	Kottamba.
Tamayuan	Petaling			Ki-katjang				
Tangal	Tengah	Tengah	Tengah	Hulit-tangah		Kabaing	Goran	
Tanguile		**Obar suluk**	**Sasak gurah**	**Klapak**				
Teak	Jati			Djati	Teck	Kyun	Sagun	Tekka.
Teluto			Telutu	Tulutu				
Tibao	Taruntum	Griting	Taruntum	Griting		Yinye	Kripa	Beriya.
Tindalo				Ki-djulang				
Toog				Bintungan		Boaungza	Pun	
Tucan-calao	Modu		Rim	Udang-udang			Kanna komper	
Yacal	**Ballow**	**Selangan batu**	**Peñiow**	**Selangan batu**		**Thingan**		
	Daru		Bedaru					
	Simumpat		Gerunggang	Ki-reming		Bebya		
	Kranji	Kranji	Krandji	Krandji			Kaddupuli	Gal-siyambala.
	Kumpas	Cumpas	Mingris					
		Mangaris	Tapang	Kayu raja				
	Tampines		Tampinis	Kapini				
	Kulim		Unsuna (?)					
	Pennagah				Vap	Gangaw	Nagesar	Na.

VI. TIMBERED AREAS AND FUTURE SUPPLY.

INDIA.

Tropical India is said to be a dry country. It contains many splendid woods, but the supply seems not to be great enough to do much more than supply the great population. It is not necessary for the owner of timber supplies to look farther when he has so great a home market. It is unlikely that India will ever do a very great timber-exporting business. It is true that quite a large number of very valuable ornamental woods are found in India, but the valuable ornamental woods can never be expected to provide a really great export trade. There are large sections of India where there is a chronic timber famine and where it has been necessary to undertake forest planting on a rather large scale to supply the needs of the local markets. There will doubtless be much more of this planting done in the future.

BURMA.

This section is more fortunately situated than is India proper. The sal and teak forests of Burma constitute most of its supply of export timber. The quantity of this is considerable and will stand exploitation for some years to come.

SIAM AND COCHIN CHINA.

These two countries are still but little known, but it is known that there are fine teak forests in Siam which are now being exploited, and there are considerable areas of dipterocarp forests in Cochin China. There are also a number of valuable ornamental woods still but little worked in these two countries.

MALAYA.

The Malay region is the part of the tropical east which is most rich in commercial timbers.

In the Malay Peninsula the best forests seem to be in the states of Keddah, Kelantan, Tringganu and Pahang. In the forests of Keddah and Tringganu are fine supplies of *chengal* (*Balanocarpus* spp.) and other dipterocarps. There is also a goodly quantity of *merbau* (*Intsia bakeri*) and there is a fair sprinkling of other valuable trees. The states of Kelantan and Pahang seem to offer some promise; although they are comparatively little known and offer considerable difficulties in the way of transportation.

SUMATRA.

This great island has extensive forests. It is reported to contain great quantities of the valuable *billian* (*Eusideroxylon zwageri*) and *chengal* (*Balanocarpus* spp.). It certainly does contain great quantities of dipterocarp woods. It sends considerable quantities of timber to the

Singapore market in small Chinese junks; but, thus far, it has not begun to be exploited by modern methods. There should be excellent opportunities for one or more large companies on the island.

JAVA.

The original forests of Java have been very largely cleared. Plantation teak is the most important timber.

BORNEO.

The forests of Borneo are extensive and comparatively untouched. It is true that the *billian* is very well worked out in some sections; but the dipterocarps are found in very great quantity and of all grades. At present the chief obstacle to the development of these forests is the distance from market and the meager facilities for transportation. As the demand for wood becomes greater, the transportation will surely be furnished and then the forests will be rapidly exploited. Borneo contains probably the most extensive and highly developed swamp forests in the world. These are now of comparatively little value; but they are sure to become of the first importance.

DUTCH INDIES.

The numerous islands of the Dutch East Indies are said, many of them, to contain valuable forests; but the nature and extent of these is largely a matter of guesswork. There is, however, a certain amount of export trade from the Dutch Indies in timbers which indicates that there may be extensive and valuable forests on some of the islands.

PHILIPPINES.

The exploitable forests of the Philippines comprise about 30,000,000 acres, a very much smaller commercial forest area than that of Borneo, Sumatra or several other places, but it is only in the Philippines that modern methods of exploitation are employed.

It is safe to say that there is a very great area of commercial forest in the tropical east, but it is by no means so great as many have supposed. Popular notions of dense jungle composed solely of valuable and exploitable trees need to be revised. It is true that the jungle is dense enough and that there are many valuable trees, but there are also many inferior trees mixed in and the valuable ones are so scattered that there are few places where a profitable enterprise can be started, if it aims at only one wood or one small group of woods.

VII. SPECIES NOTES.

In the following notes it is aimed to give first the accepted common name in the Philippines, then the common names in the other countries, the distribution, structure and special properties, uses, and references to the principal literature. The common names for Indian, Burmese and

Ceylon woods were taken from Gamble. Those from the Malay Peninsula from Ridley and those from the Dutch Indies from Van Eeden and from G. J. Filet's Dictionary of Plant Names. Many of the notes on structure are taken from Gamble.

I have not been able to prepare a key to the different woods of the region; but, with the aid of Gamble's Manual, it has been possible to prepare family summaries in some cases.

The term "seasonal or growth ring" has seemed preferable to "annual ring" and so is used. Also the term "pith-ray" is preferred to "medullary-ray."

Unless specially indicated, the structure described is that which is seen in the cross section, because it is in this section that the relationship of the different elements composing the wood is most clearly shown. The terms "pore" and "vessel" are used interchangeably.

The structural feature most often noted in the longitudinal section of the wood is the numerous parallel transverse lines or "ripple marks." These are due to regularly arranged pitting of the tracheids (see Plate XXVI, fig. 55) or to regular arrangement of small pith-rays. The latter condition is probably much the less frequent; and, when it occurs, gives the appearance of ripple marks only on the tangential section.

It will be remarked in following through these notes that a common or trade name usually applies to more than one species of plant. It frequently happens that the wood structure is identical for a large group of species. Occasionally the structure is seemingly identical for several genera, as in the *Ebenaceæ,* which seem to have only one type of structure for the whole family.

The following are the abbreviations which I have found it convenient to use in the species notes:

Gamb. Gamble, J. S. A Manual of Indian Timbers. New and revised edition. London, 1902.

Phil. Woods Foxworthy, F. W. Philippine Woods. This Journal 2 (1907) Botany 351–404.

Nörd. Nördlinger, H. Holzquerschnitte. Stuttgart (1851–1888). Vols. 1–11.

Van Eed. Van Eeeden, F. W. Houtsoorten van Nederlandsch Oost-Indië (3d ed. by J. J. Duyfjes). Cat. XII. van het Kol. Mus. te Haerlem. 1906.

Ridl. Ridley, H. N. Timbers of the Malay Peninsula. In the Agricultural Bulletin of the S. S. and F. M. S. Singapore. Vol. 1 (1901).

Wiesner Wiesner, J. Die Rohstoffe des Pflanzenreichs, 2d ed. Leipzig. 1903. Vol. 2.

Boulger Boulger, G. Wood, 2d ed. London, 1908.

Stone Stone, H. The Timbers of Commerce. London, 1905.

Lewis Lewis, F. E. Ceylon Tea-box Woods. In Trop. Agric. 18. (1898) 307–310.

Gard. Gardner, R. Mechanical tests of thirty species of Philippine Woods. Forestry Bureau (Philip.). Bull. 4, 2d ed., 1907.

Newton Newton, Howard. Notes and Experiments on the different kinds of Timber in Ordinary Use in the Straits Settlements. Singapore, 1884.

K. & V. Koorders, S. H., and Valeton, Th. Bijdrage tot de kenniss der Boomsoorten op Java. Batavia (1894–1909).

Janssonius Janssonius, H. H. Mikrographie des Holzes. Leiden, 1906–. Two parts already issued.

Holtzapffel Descriptive Catalogue of Woods. London, 1852.

Becc. Beccari, O. Nelle foreste di Borneo. Florence, 1902.

Bargagli-Petrucci Sulla struttura dei legnami raccolti in Borneo del Dott. O. Beccari. In Malpighia, 1902.

Semler Tropische und nordamerikanische Waldwirtschaft und Holzkunde. Berlin, 1888.

Winton Hanausek, Dr. T. F. The Microscopy of Technical Products., translated by Andrew L. Winton, Ph. D., with the collaboration of Kate G. Barber, Ph. D. New York, 1907.

Jumelle Ressources Agricoles et Forestieres des Colonies Francaises. Marseille, 1907.

Safford Useful Plants of Guam. Contrib. U. S. Nat. Herbarium, **9.** 1905.

Pierre Flore Forestiere de la Cochinchine. Paris.

Watt Dict. Dictionary of the Economic Products of India. Calcutta, 1885–1896.

E.-Pr. Engler, A., und Prantl, K. Die natürlichen Pflanzenfamilien.

Sp. gr. Specific gravity.

M. Malay.

Hind. Hindustani.

Beng. Bengali.

Tam. Tamil.

Burm. Burmese.

Cing. Cingalese.

Phil. Philippine.

PTERIDOPHYTA.

The only use to which members of this group are put as timber seems to be in the occasional use of the trunks of tree ferns as the corner posts of native houses. This is reported from Benguet in northern Luzon and from New Guinea. Such a use could only be very local, where tree ferns were very abundant or where other timber was scarce. The convenient size and location of these stems will probably account for their use.

Among the Bagobos, on the east slope of Mount Apo, in Mindanao, the tree ferns are used very extensively, in preference to other woods. They are said to be very durable; and, certainly, their shape is such as to make it possible to utilize them with very little effort.

GYMNOSPERMS.

This group, which contains the coniferous trees, furnishes the greatest part of the timber supply of the world, but it is only scantily represented in the eastern tropics. There are a few representatives which are used to some extent, as the Benguet pine of northern Luzon, the pines and cedars of the Himalayan slopes and some of the species of *Podocarpus,* which are rather widely distributed. However, none of these are used to such an extent as to be of very general interest in this region. Wherever met with, the wood may be readily distinguished by its nonporous structure.

TAXACEÆ.

Taxus baccata L.

Himalayas, upper Burma, China, Japan, the Philippines, etc. Forms of this species are found in the high mountains throughout the tropics of the East.

Wood hard, heavy (sp. gr. 0.74–0.94), close and even-grained, smooth. Sapwood white; heartwood orange-red, light-red, or white. Seasonal rings marked by a conspicuous line. Pith-rays very numerous, regular and long. Used for bows, carrying poles, and native furniture.

Stevenson 136–139; Gamb. 101; Nörd. I., Mech. Eigensch. d. Hölzer 542; Stone 245; Holtzapffel 110.

Podocarpus neriifolia Don.

British India, Burma, the Philippines, Borneo, Java, Sumatra; a mountain tree of very wide distribution.

Wood light-yellow or yellowish-gray; homogenous, even-grained, soft to moderately hard and moderately heavy. Seasonal rings distinct though faint. Pith-rays very fine, numerous. No resin ducts, but scattered cells with resin prominent on thin section. Used in general carpentry and is excellent to work, but would probably not resist white ants; also employed for oars, spars, masts, and to make tea-boxes. Seasons well and does not warp or shrink.

Gamb. 702, *tab. XVI, fig. 3;* Nörd. V. and X. (*P. bracteata* Bl.).

Numerous other species of *Podocarpus* occur in the Malay region, but they are usually extremely local and on high mountains. So far as known their wood resembles that just described. Australian species of *Podocarpus* are often known as "yellowwood" because of the color of the wood.

PINACEÆ.

Agathis alba (Lam.) (*A. dammara* Rich.) Plate XXII, fig. 1. Almaciga (Phil.); dammar (M.).

Malay Peninsula and Archipelago.

Wood soft and light, even-grained, easily worked, white, not very durable. Used for planks and temporary construction.

Cedrus deodara (Roxb.) Loud. Deodar; Himalayan cedar.

Himalayan region.

Wood moderately hard, light to moderately heavy, strong-scented, oily; sapwood white; heartwood light yellowish-brown. Seasonal rings distinctly marked by the darker autumn wood. Pith-rays fine, unequal and irregular, fairly numerous, not deep. Resin-ducts none, the oil contained in wood-cells in the heartwood. Railway sleepers, bridge work, building; rather brittle to work and does not take paint or varnish well. Has strong odor. Contains a good deal of oil, which prevents it from becoming water-logged, very durable. Resists wet, also white ants, and apparently does not suffer much from dry rot.

Gamb. 710–716, *tab. XVI, fig. 4;* Nörd. XI.

Pinus. Wood usually very resinous and homogenous, consisting of alternate layers of soft and often spongy spring wood, and of hard, darker colored autumn wood; heartwood distinct. Pith-rays fairly numerous, rather irregular, fine to moderate broad. Vertical resin-ducts large and numerous, visible on horizontal and vertical sections.

Pinus insularis Endl. Plate XXII, fig. 2. Saleng.
Philippines.

A wood much resembling that of some of the yellow pines in the United States; very resinous and of considerable local importance for planks, house building, etc.

Phil. Woods 354.

Pinus excelsa Wall. Blue pine.
Himalaya.

Light and moderately hard. Sapwood white; heartwood light-red. Railroad ties, planks, etc.

Gamb. 704; Nörd. VIII.

Pinus longifolia Roxb. Long-leaved pine.
Himalaya.

Light and moderately hard. Sapwood white; heartwood light-reddish-brown. Wood inferior to the preceding.

Gamb. 707, *tab. XVI, fig. 3;* Nörd. VII.

Pinus khasya Royle, *P. gerardiana* Wall., and *P. merkusii* Jungh. & de Vr. are also used to some extent.

Cupressus torulosa Don. Himalayan cypress.
Himalaya.

Moderately hard and moderately heavy. Sapwood white; heartwood light-brown with darker streaks, very fragrant. Very durable. Used in building and for wood carving.

Gamb. 696, *tab. XVI, fig. 1;* Nörd. X.

ANGIOSPERMS.

MONOCOTYLEDONS.

The monocotyledons are not to be considered as of much importance in the production of commercial woods, but they do have some important uses which must not be overlooked.

PANDANACEÆ.

In some places the trunks of the arborescent pandans are used for rough or temporary work, and they furnish what is sometimes called "porcupine wood." They are probably of little, if any, more importance than the trunks of tree ferns.

PALMÆ.

Many palms have stems which, at least in their outer part, are very hard and strong. These palm stems are admirably suited for certain uses, as the flooring of native houses, the fashioning of bows and carrying poles, the making of ornamental pillars, etc. In Borneo the *nibong* palm (*Oncosperma* spp.) is the chief flooring material for both houses and boats. Several species of *Livistona* are used in the Philippines under the name of *palma brava.* The use of palm stems is usually purely local, although occasionally small amounts are sent to Europe for use in cabinet work. Because of the comparative infrequence of their commercial use and because their structure is of the type so well known in monocotyledons, it is not necessary to further consider them here.

GRAMINEÆ.

Bamboos of various sorts are the main reliance in many kinds of native structures, but their use is local. It is not customary to raise them for export, and their structure is very generally recognized.

DICOTYLEDONS.

CASUARINACEÆ.

Sapwood and heartwood not sharply differentiated, the color becoming gradually darker from sap to heart. Vessels moderately large, and often in radial or oblique rows. Wavy, concentric lines of wood parenchyma. Pith-rays small to very large; the large ones of very infrequent occurrence in *Casuarina equisetifolia,* but very general in the other species. Wood fibers very thick-walled and making up most of the mass of the wood.

Casuarina equisetifolia Forst. Plate XXII, fig. 3. Agoho (Phil.); ru (Borneo, Malaya); chouk (Tam.); tinyu (Burma); ironwood.

On sandy shores throughout the eastern tropics, where its resemblance in habit to the pines and firs makes it very marked.

Very hard and heavy or very heavy; difficult to work. Sapwood and heartwood differing in color only in degree of brown. A very durable construction timber and, perhaps, the best firewood in the world.

Phil. Woods 370, *fig. 38;* Gard. 68; Gamb. 665; Boulg. 233; Blits 12, 23–25; Wiesner 2:875–879; Becc. 583.

Casuarina sumatrana Miq. (ru ronan (M.), ironwood), and other species are occasionally found in the Orient. They differ from the preceding in having very large and distinct pith-rays. They are, consequently, better suited for cabinet work.

Blits 13; Bargagli-Petrucci 9, *tab. IV;* Becc. 583.

JUGLANDACEÆ.

This family is not found very abundantly in this region. The few representatives are usually scattered and comparatively unimportant. Pores scattered; pith-rays fine; wavy concentric lines of wood parenchyma.

Englehardtia serrata Bl. Plate XXII, fig. 4.
Malaya.

An easily worked wood of not much importance.

FAGACEÆ.

The members of this family are fairly numerous in the Orient, but they are of comparatively little importance. Many of the species of *Quercus* furnish a rather inferior quality of wood, which is said not to be durable. Some species are used in India, but their use can not be said to be at all general. Wood brownish, very hard and moderately heavy to heavy, generally with a distinct, darker-colored heartwood. Pores small to large, arranged in radial lines or elongated patches. Seasonal rings not distinct. Wood parenchyma in wavy concentric lines and more or less grouped about the vessels. Pith-rays small to very large.

Quercus. This genus is divided into two groups, according to the size of the pith-rays. First group, all the pith-rays very fine, very numerous, uniform and equidistant. Wood seasons well, does not warp or crack. Second group, pith-rays of two classes, very fine and broad, the latter very prominent on a vertical section, making a silver grain of rather large plates. Wood usually warps and splits in seasoning.

Quercus soleriana Vid. Plate XXII, fig. 5. Cateban (Phil.).
Philippines.

Used comparatively little; said not to be durable.

ULMACEÆ.

Celtis australis L.
Southern Europe, tropical and temperate Asia.

Rather local in hilly country.

Wood gray or yellowish-gray, with streaks of darker color, hard and heavy, tough and strong. Used for tool handles and other implements. Gamb. 625, *tab. XIII, fig. 3;* Nörd. I.

Other species of *Celtis* furnish wood much like the above and which is used for the same purposes.

Trema amboinensis Blume. Anadiong (Phil.).
Tropical Asia to Australia.

Wood light-colored, soft or moderately hard; moderately heavy. Pores small or moderate-sized; pith-rays fine and moderately broad. Used in light or temporary construction.

Gamb. 630.

MORACEÆ.

Artocarpus. Heartwood moderately hard to hard, yellow, turning brown on exposure, seasons well, moderately heavy to heavy, usually containing a white substance in pores and pith-rays. Pores moderate-sized to large, often surrounded by circular patches of wood parenchyma. Pith-rays fine to moderately broad, distinct, not numerous.

Artocarpus integrifolia L. f. Jak tree; lanca; nanca.
India and Malaya; very widely cultivated.

Yellowish to yellowish-brown, darkening very decidedly on exposure to the air. Heavy, moderately hard, readily polishing. Used for the backs of musical instruments, furniture and fine carpentering. Softer and finer grained than is the wood of most other members of the genus.

Gamb. 652–654; Watt Dict. 1:332; Ridl. 257; Van Eed. 232; Stone 205; Holtzapffel 88.

Artocarpus hirsuta Lamk.
India and Malaya.

Yellowish-brown, hard and heavy durable wood. Used for house building, furniture, etc.

Gamb. 652, *tab. XIII, fig. 6;* Nörd. X; Watt Dict. 1: 329–333.

Artocarpus lancifolia Roxb. Keledang (M.).
Federated Malay States.

Heartwood hard and heavy, yellow, turning dark-red, close-grained, pores rather large partitioned, rays fine, conspicuous, lighter colored. Durable under ground and the favorite wood for Chinese coffins.

Ridl. 256; Newton 4.

Artocarpus nobilis Thw. Del (Cing.).
Ceylon and British India.

Furnishes a very readily worked wood similar to that of *A. integrifolia.*

Gamb. 654; Stone 204.

The following species are also of importance in the regions indicated:

Artocarpus chaplasha Roxb. British India. Gamb. 654; Nörd. X.

Artocarpus lakoocha Roxb. British India and Malaya. Gamb. 655; Nörd. X.

Artocarpus gomeziana Wall. Malaya. Morubi (M.). Bargagli-Petrucci 12; Becc. 583.

Artocarpus superba Becc. Mentawa (Borneo). Bargagli-Petrucci 12; Becc. 583.

Artocarpus cumingiana Trec. Plate XXII, fig. 6. Anubing (Philippines). Phil. Woods 372.

All the above furnish hard and durable wood similar to that of *A. hirsuta*.

Ficus. The species of this genus usually produce wood of inferior quality, and are of only local importance.

Ficus nervosa Heyne.
Ceylon.

Used for tea chests.

Lewis 310.

Sloetia sideroxylon T. & B. Plate XXII, fig. 7. Tampines (M.).
Malay Peninsula and Archipelago.

Very hard and heavy, brownish-yellow, fine-grained wood. Formerly much used at Singapore and considered one of the most durable woods of the region. Now very scarce. Used for corner posts of houses, heavy construction, carrying poles, etc.

Newton 3; Ridl. 254; Becc. 583; Bargagli-Petrucci 13, *tab. IV.*

Taxotrophis ilicifolia Vid. Plate XXII, fig. 8. Cuius-Cuius (Phil.).
Philippines.

A very hard and heavy wood; heartwood streaked with greenish or dark-brown, sometimes almost black. Frequently with scattered dark spots. Pores of medium size, scattered. Concentric, rather wide lines of wood parenchyma. Pith-rays fine but distinct. This is one of the most beautiful woods for walking sticks. (See p. 433.)

URTICACEÆ.

Boehmeria rugulosa Wedd.
British India.

The pretty, reddish, moderately hard, durable wood is used to make eating vessels, plates, vessels for milk and other drinkables.

Gamb. 657; Nörd. IX; Watt Dict. 1:484.

PROTEACEÆ.

Very large pith-rays always present and connected by narrow, continuous lines of wood parenchyma. Pores of moderate size.

Grevillea robusta A. Cunn. Silk oak.
Queensland and New South Wales, but cultivated throughout the tropical east.

Wood hard, light-reddish-brown; sapwood grayish-white. Suitable for fancy furniture.

Nörd. IX; Gamb. 576; Stone 185.

Helicia. This genus has quite a number of species in this region, but they are not commonly found with large numbers of individuals.

Helicia excelsa Bl. Membatu laiang.
Malay Peninsula.

A moderately hard and heavy wood.
Ridl. 248.

Helicia petiolaris Benn. Gong; putat tepi.
Malay Peninsula.

Very heavy and hard, used in house building.
Ridl. 248.

Helicia philippinensis Meissn. Plate XXII, fig. 9.
Philippines.

Usually well up in the mountains and does not occur in quantity.

Helicia robusta Wall.
British India and Malaya.

A hard and heavy wood which is used for house building.
Gamb. 575.

Helicia sp.? Plate XXII, fig. 10. K'runtum; Semaior daun basa (M.).
Sarawak.

I am not at all sure of the determination of this wood, but its structure seems closest to *Helicia*. This is an important wood in northern Sarawak. It is hard and heavy, reddish, coarse-grained and durable. It is used in house building.

SANTALACEÆ.

Exocarpus latifolius R. Br.
Australia and the Malay Archipelago.

Heartwood said to provide a substitute for sandalwood. (See p. 432.)

Santalum album L. White or yellow sandalwood; chandan, sandal (Hind.); santagu (Burm.); sandana (Philippines and Borneo).
British India and Malaya.

Wood yellow, reddish in spots, with alternate lighter and darker (reddish) zones and inconspicuous vessels and pith-rays. The wood has a strong, penetrating, aromatic odor when first cut and this is stronger the darker the wood. Uniformly dense, moderately hard and heavy. Used from the most ancient times as incense for idols and the manufacture of oil, as well as for the manufacture of small ornaments. (See p. 432 for discussion of sandalwoods.)

Gamb. 585–588; Wiesner 2:908; Nörd. XI; Stone 191.

Santalum freycinetianum Gaudich. and other species of the Hawaiian Islands also furnish some of the white and yellow sandalwood of commerce.

OLACACEÆ.

Wood usually hard to very hard and heavy; pith-rays very fine and regular; pores small and scattered; wood parenchyma in very fine broken and irregular lines, connecting the pith-rays.

Anacolosa luzoniensis Merr. Malabignay.
Philippines.

A pale reddish-brown wood. Hard and heavy. Used for house posts, etc. Several other species occur and are used in British India, the Malay Peninsula, and Java.

Ctenolophon parvifolius Oliv. Bungkal (M.).
Malacca, Borneo, Sumatra.

Wood rather soft, brownish-white, with very fine rays and few large pores, which are filled with resin.

Ridl. 103.

Ochanostachys amentacea Mast. Petaling (M.).
Malacca and Borneo.

Dark, yellowish-brown wood. Durable. Pores in short radial lines. Structure very much like that of *Strombosia* and wood used for the same things. Said to be proof against white ants.

Ridl. 102.

Ochanostachys bancana (Becc.) Valeton, of Banca, Liennga, and Sumatra, is also known as *petaling* and is used for the same things.

E.-Pr. Nachtr. 147.

Scorodocarpus borneensis Becc. Plate XXII, fig. 11. Kulim (M.).
Borneo and the Malay Peninsula.

Wood very dark-brown; very hard and heavy, and very durable in the water. Seems to resist the teredo remarkably well and is therefore much in demand for piling. Also used for bridges and house construction. The wood, when fresh, has a very strong odor of onions. If the wood is not used promptly after being cut, a kind of dry rot starts in at the end of the log. The behavior here is much like that of *liusin* (*Parinarium griffithianum*) under similar conditions.

Becc. 574; Ridl. 102; Bargagli-Petrucci 14, *tab. IV*.

Strombosia philippinensis (Baill.) Rolfe. Plate XXII, fig. 12. Tamayuan.
Philippines.

Very hard, moderately heavy to heavy. Dull-yellowish to pinkish; fine- and straight-grained. Posts, house building, joists, roofing, axe handles.

Phil. Woods 393.

Other species of *Strombosia* are found in Ceylon, British India, and Java. They much resemble the preceding and are used for the same purposes.

Ximenia americana L. Bidara-laut (M.); kakira.
Tropical America, Africa, Asia, the Malay Archipelago and the Philippines.

A hard and very heavy yellow wood, in appearance and odor similar to the white sandalwood, and used for it in the East Indies.

Gamb. 163; Ridl. 103; Pierre 265.

MAGNOLIACEÆ.

Wood usually soft and not very durable, even-grained, white, gray, yellow or olive-brown. Seasonal rings distinct; pores small, fairly regular; pith-rays fine, numerous, regular. Not a group of much commercial importance. The wood is usually employed for work of only a temporary nature. The best known and generally used species is:

Michelia champaca L. Plate XXIII, fig. 13. Champaca: tjempaca-kuning (M.).
British India and Burma and cultivated everywhere in the tropics.

Sapwood white, heartwood bright-olive-brown. This soft but durable wood is used for house and carriage building, as well as for furniture, cabinet work, carving, carriage panels, and tea-boxes.

Gamb. 12; Nörd. VIII; Watt Dict. 5:243; Lewis 308; Ridl. 9; K. & V. 4:161; Van Eed. 4; Pierre 3; Janssonius 1:103.
Other species are used, but this seems to be the best.

ANONACEÆ.

This is one of the most sharply marked families in the structure of its wood. The pith-rays are moderately large and prominent, and they are connected by straight, parallel lines of wood parenchyma, which, with the pith-rays, give a distinctly ladder-like appearance to the wood. The color is often very light, though it is sometimes dark. The trees of this family are not commonly very large and the wood is often not very durable; moreover, the individuals are usually of scattered occurrence; consequently the wood is not ordinarily used in structural work or where large quantities of timber are required. The following are some of the better known *Anonaceæ*.

Canangium odoratum Baill. (*Cananga odorata* Hook. f. & Th.). Plate XXIII, fig. 14. Ilang-ilang (Phil.); kadatnyan (Burm.); kananga (M.).
British India and Malaya; cultivated in all tropical lands.

A light but tolerably hard wood; used for structural purposes and cabinet work. Sometimes used for house posts in the Philippines. Resonant and much used by Malays for tom-toms.

Gamb. 16; K. & V. 9:279–283; Van Eed. 7; Pierre 18; Ridl. 10; Janssonius 1:121.

Cyathocalyx zeylanicus Champ. Kekala (Cing.).
British India and Ceylon.

Wood moderately hard, yellowish-white, used for tea-chests.

Lewis 308.

Goniothalamus tapis Miq. Tapis (M.).
Malay Peninsula and Archipelago.

Moderately hard and heavy; said to be used for house building in Java.

Van Eed. 8; Ridl. 10.

Miliusa velutina Hook. f. & Th. Dom-sâl (Hind.); Thabutkyi (Burm.).
East Indies.

Light-brown, tolerably hard wood; easily worked and durable; used for carts, agricultural implements, spear shafts and oars.

Gamb. 21; Watt Dict. 5:545.

Mitrephora edwardsii Pierre.
Tropical Asia.

Yellowish, hard and very pliable. Used for balances, and small articles of furniture.

Pierre 35.

Polyalthia cerasioides Benth. & Hook. f.
British India and Burma.

Greenish-brown, moderately hard and heavy, wood for house-finishing, masts and spars.

Gamb. 17; Watt Dict. 6^1:313.

Polyalthia longifolia (Lam.) Benth. & Hook. f. Indian fir; mast tree.
India and Ceylon; cultivated in all parts of India.

Produces white to yellowish, soft, very readily bent wood, for barrels, drum cylinders, boxes, lead pencils and matches.

Watt Dict. 6^1:314; Gamb. 18.

Polyalthia suberosa (DC.) Benth. & Hook. f.
British India and Ceylon, Philippines.

A hard, heavy, tough and durable wood, used like the preceding.

Watt Dict. l. c. 314; Gamb. 17.

Polyalthia subcordata Bl.
Java and Borneo.

Produces, presumably, the very peculiar cabinet wood "Baloen adock."
Van Eed. 8; Janssonius 1:134.

Xylopia parvifolia Hook. f. et Thoms.
Ceylon.

Produces wood for tea-chests.

Lewis 308; Gamb. 20.

MYRISTICACEÆ.

Wood usually light, somewhat soft, reddish-brown, with regular prominent rings of hard wood without pores, looking like seasonal rings. Pores in short radial strings, moderate-sized, rather scanty, arranged en echelon. Pith-rays fine, numerous, irregular.

Myristica malabarica Lam.
British India.

Used for structural work but is not very durable.

Gamb. 555.

Myristica philippensis Warb. Plate XXIII, fig. 15. Duguan.
Philippines.

Wood moderately hard and moderately heavy, not durable, badly attacked by the beetles. Light or temporary construction.

Phil. Woods 381.

Other species of *Myristica* have wood of much the same structure and used for the same purposes as that here described. In Borneo, the wood of *Myristica* is often known as *cumpang*. *Bawang,* a fairly good wood of Dutch East Borneo, seems to belong here. This wood is shipped to the New York market, to be used in the making of cigar boxes. Some of the vessels are large and filled with a dark-red gummy deposit.

Lewis 309.

MONIMIACEÆ.

Wood soft or moderately hard, usually light and not durable. Pores small, fairly numerous, regular. Pith-rays broad, at irregular distances, with fine ones between. Usually of little importance.

Tambourissa quadrifida Sonn.
Mascarenes, Java.

Produces the very light "bois de tambour."

LAURACEÆ.

The woods of this family are exceedingly variable in structure and appearance, as well as in physical and chemical properties. Many representatives of the family have wood which has a very pronounced odor, usually agreeable, but markedly unpleasant in some, as e. g. the "stink wood" (*Ocotea bullata*) of South Africa.

The woods of the family can be grouped roughly according to several types which are probably best handled under the common names of their best known representatives.

BILLIAN.

Eusideroxylon zwageri T. & B. Plate XXIII, fig. 18. Billian (M.); kajoe besi (M.); Borneo ironwood; ulin (oelin) (E. Borneo); eijserhout (Dutch)
Borneo, Sumatra, Banka, possibly also in the Malay Peninsula.

Wood very hard and very heavy. Extremely durable. Yellowish to dark-brown, becoming almost black with age. Pith-rays fine; vessels medium-size to large, fringed with wood parenchyma which is continued tangentially into fine, usually discontinuous lines. Large vessels divided longitudinally into several compartments and filled with a yellowish, glistening crystalline substance, which also seems to fill many of the wood

parenchyma cells. Woody tissue very dark and giving a strongly glistening surface in fresh transverse cut.

Uses.—Piling, heavy construction, bridges, telegraph and telephone poles. Much used for shingles in Borneo. Said not to shrink on exposure to weather. Proof against termites. Perhaps the best wood in the world for piling. Resists termites and ship worm—perhaps because of the action of the substance filling the vessels and wood parenchyma cells.

Kinds of billian.—At most places where *billian* is worked, it is claimed that there are two or more kinds of this wood; e. g. *billian simpor, billian bulu, billian tembaga,* etc. It is certainly true that some *billian* is much lighter and less durable than the standard sort. Some *billian* is so light that it will float when dry. There is a difference between sap and heartwood and between rapidly grown and normal trees which will, I think, account for this. I have made efforts to examine the lighter grades of *billian* wherever they occurred and I have uniformly found those trees producing the lighter grades of *billian* to be very rapidly grown; in fact, they were second growth trees, having started as sprouts from old stumps. The young stump sprouts, being supplied with great quantities of nourishment by the established root system of the old stump, were able to make exceedingly rapid growth. In making this growth, there was not time for the deposit in the vessels and tissues of those substances which make for weight and durability in as great quantities as is the case where the tree grows at its normal and slower rate; consequently, the rapidly grown young wood is not so heavy nor so durable and, probably, not so strong as that of the normally grown tree.

Billian is one of the very few woods of Borneo which is known outside this region. It is exported to Europe in some quantity and has been used for piling at several places in Holland and France. It is deserving of wider use, but a few years vigorous exploiting will exhaust the available supply of it. It is one of the trees which is deserving of planting and careful handling.

Ridl. 247; Newt. 4; Bargagli-Petrucci 18; Becc. 581; Blits 27.

CAMPHORWOOD.

Cinnamomum camphora (L.) Nees & Eberm. Plate XXIII, fig. 17.
China, Formosa, Japan, and cultivated in many other regions.

Wood moderately hard and light to moderately heavy. Grayish to dark-red, often prettily marked. Grain rather coarse. Pith-rays fine, vessels moderately large to small. Distinct seasonal rings present, the larger vessels being arranged in the young wood and the smaller ones en echelon in the older wood. A rapidly growing wood. Durable, because of the very large amount of camphor it contains and which renders it distasteful to insects. It is used very extensively in the making of chests,

wardrobes, etc. It is so much in demand that it is very much imitated. Soft and absorbent woods are used in place of camphorwood very often, the wood being treated with a solution of camphor or other oil, which gives it, temporarily, an odor resembling that of the camphorwood. (See p. 426.)

Flückiger, Pharmakognosie, III, Aufl. (1891) 151; Van Eed. 201; Holtzapffel 78.

A number of other trees in the *Lauraceæ* furnish highly aromatic wood which sometimes resembles camphorwood in odor. Some of the Borneo and Philippine species of *Cinnamomum* and possibly other genera, have wood which is so strongly aromatic that it could probably be very well employed for the same kinds of work as the true camphorwood. The strongest scented one of these is a Sarawak wood known as *kappla* (Becc. 581), of which I have only sterile material and which I am unable to put in a genus. Another very strongly scented wood of the same region is known as *medang lada;* it is a species of *Cinnamomum,* and occurs locally in some quantity.

MEDANG.

This is a name applied to a large number of different species which show some resemblance in the structure of their wood. One of the best known of these is *Litsea perrottetii* F.-Vill. (Plate XXIII, fig. 19) of the Philippines, which is known in Manila as *baticulin.* The pith-rays of the different *medangs* are fine to moderately broad; vessels fine; seasonal rings not distinct. Fine-grained; soft or moderately hard woods; white or grayish in color; usually very easily worked and not very durable. They are used for light or temporary construction and are pretty widely known. Fifteen or twenty or more kinds of *medang* are found, but they are not clearly marked off one from another, because the trees producing them are usually more or less scattered. By cutting a number of different kinds of *medang* it is possible to get timber in some quantity in many localities, while, if only one particular kind of *medang* were used, it would not be possible to get sufficient of the wood for many purposes. This probably accounts for the composite nature of the wood supply known as *medang.* Sometimes dark-colored woods are found under this name, but the lighter-colored ones are much the more common.

Representatives of the following genera of this part of the world may occasionally be found under the name of *medang: Machilus, Phoebe, Notaphoebe, Actinodaphne, Neolitsea, Litsea, Dehaasia, Cryptocarya, Endiandra* and *Lindera.*

Occasionally dark-yellowish woods, species of *Beilschmiedia,* are found which seem to be really intermediate between *billian* and *medang. Beilschmiedia cairocan* Vid. (Plate XXIII, fig. 16) of the Philippines, known as *malacadios,* is a very good wood of this class. Some species of *Cryptocarya* probably belong also in this class.

HERNANDIACEÆ.

A very small family of scattered trees. Wood usually of poor quality, soft and light.

Gyrocarpus jacquini Roxb.
Tropics of both hemispheres.

Very soft and very light. Pores large and medium-sized, scanty, often subdivided, uniformly distributed. Pith-rays very short, moderately broad, the distance between them greater than the transverse diameter of the pores. Used for boxes, toys and small boats.

Gamb. 350.

Hernandia peltata Meissn. Palatu (Cing.).
Seacoasts of tropics everywhere.

Very soft and very light, gray. Pores moderate-sized to large; collected in oblong or linear more or less concentric dark scattered patches of loose tissue. Pith-rays very fine, numerous, with occasional broader ones. Cellular tissue soft.

Gamb. 575.

CAPPARIDACEÆ.

Wood white or yellowish-white, moderately hard or hard. The main character useful in determination is that of pores in radial lines, not between each pair of pith-rays, but at intervals, pairs without pores coming between those that contain pores.

Capparis grandis L. f.
British India, Burma and Ceylon.

A white, moderately hard, durable wood.

Gamb. 35; Nörd. X; Watt Dict. **2**:130.

Crataeva religiosa Forst.
Widespread in the tropics.

Wood yellowish-white, when old turning yellowish-brown, moderately hard, even-grained. Used for drums, models, writing boards, combs and in turnery. Not durable and liable to the attacks of beetles.

Gamb. 32; Nörd. X.

PITTOSPORACEÆ.

Wood white, moderately hard, even-grained. Seasonal rings faintly marked. Pores small, rather scanty and irregularly distributed. Pith-rays fine, prominent, not numerous, pale.

Pittosporum ferrugineum Ait. Giramong (M.).
Malay Peninsula and Archipelago to Australia.

Light to moderately heavy and soft or moderately hard. Wood white, fine-grained, pores very small in clusters, fairly numerous, pith-rays fine but rather distinct, rings fairly distinct.

Ridl. 12; Janssonius 1:226.

HAMAMELIDACEÆ.

Wood close-grained, pores in radial rows, not very numerous, small and very small and only a few with wide lumen, uniformly distributed; pith-rays very fine, numerous.

Altingia excelsa Noronha. Rasamala (M.); nan-ta-yoh (Burm.).
British India, Burma, Java.

Wood hard, heavy, resinous, red, cross-grained. Pores small, uniform and uniformly distributed in lines between the pith-rays. Pith-rays fine, equidistant. Planks or indoor work in dry places.

Gamb. 332; Nörd. IX (*Liquidambar altingiana* Bl.); Watt Dict. 1: 201; Van Eed. 124.

Bucklandia populnea R. Br.
British India, Burma, Sumatra, Java.

Wood reddish-brown, rough, moderately hard and heavy, close-grained, durable. Seasonal rings marked by a dark line with fewer pores. Pores small, evenly distributed in radial lines. Pith-rays fine, very numerous, uniform and equidistant. Planking and door and window frames.

Gamb. 331, *tab. VII, fig. 2;* Nörd. IX; Van Eed. 125; Watt Dict. 1:545.

Fothergilla involucrata Falc. (*Parrotia jacquemontiana* Dcne.).
Himalaya.

Very hard and very heavy, very close-grained; light pinkish-white; pores extremely small, rather scanty. Walking sticks, tent-pegs, charpoys, and rice-pestles, also for native bows for throwing pellets.

Gamb. 331; Watt Dict. 1:111.

ROSACEÆ.

The trees of this family have usually a very fine-grained and uniform wood; however, the only genera of importance from our present viewpoint, *Parinarium* and *Pygeum,* have wood of different structure; these have vessels of medium size to large. All of these rosaceous woods seem to be possessed of a more or less pronounced oxalic acid odor.

Parinarium. Wood very hard and heavy; vessels large and scattered; wavy thin lines of wood parenchyma usually present; the one exception known to me is *Parinarium oblongifolium* Hook. f., which seems to have wood of the structure of a *Pygeum.*

Parinarium griffithianum Benth. Plate XXIII, fig. 20. Liusin (Phil.); Merbatu layang (M.); Manoc (Java and Celebes).
Tenasserim or Andaman Islands, Malacca, Borneo, Philippines, to Australia.

Of wide distribution and rather scattered occurrence; a large tree. Wood very hard and heavy, light-red; an exceedingly durable wood, but

subject to dry rot at the heart. In demand for piles. Very much like the South American *P. guianense.* (Stone 101, *pl. VII, fig. 57.*)

Gard. 67; Phil. Woods 386; Ridl. 145; Van Eed. 122.

Parinarium oblongifolium Hook. f. Ballow (M.); Johore teak.
Malacca, Pahang.

Wood very hard and heavy, with the structure of *Pygeum* spp. This wood was formerly used for piling at Singapore, and exported from there to Ceylon, etc., but the supply of it was not great and seems to have become almost exhausted. I believe it impossible to procure it on the Singapore market at the present time. It has given way to a dipterocarp wood from Borneo, probably a species of *Shorea,* which is sold under the name of *ballow.*

Ridl. 144; Newton 3.

Pygeum maingayi Hook. f. Fafoo laut (M.).
Malacca.

Wood hard and heavy, pale-olive or olive-white with brownish striae and gamboge-colored stains; coarse grain. Construction work. Other species of *Pygeum* are also used; but, so far as known, they agree in structure with the preceding, and do not occur in any considerable quantity.

Ridl. 145.

Pygeum preslii Merr. Plate XXIII, fig. 21. Lago.
Philippines.

Wood moderately hard and moderately heavy, red; fine-grained, but with occasional concentric lines of large pores which contain red deposits. Used in house building.

LEGUMINOSÆ.

This is, next to the *Dipterocarpaceæ,* the most important family of plants in the Orient in the production of commercial wood. In the production of furniture and ornamental woods, it surpasses all others. Many representatives of the family have hard, heavy wood, which is often highly colored and shows good grain. Many of the woods are also good for structural work.

Several clearly marked types of structure are found in the family, but these structural types do not entirely correspond to the natural divisions of the family.

Gamble[1] has grouped the Indian members of the family in seven groups according to structure. I have followed him in the main, but have found it desirable to combine two of his groups, the *Ougeinia* and

[1] Manual of Indian Timbers (1902) 227.

Albizzia groups, because, in practice, I have not found them readily distinguishable. The different types of structure as I have recognized them are:

1. OUGEINIA-ALBIZZIA TYPE.

Vessels moderately large, scattered or more or less distinctly radially or concentrically grouped; distinctly fringed with wood parenchyma, which usually forms elongated patches, which are sometimes almost continuous concentrically. This is much the largest and most representative group in the family. Examples of this type of structure are: *Ougeinia dalbergioides, Intsia bijuga, Albizzia procera.*

2. ACACIA-CASSIA TYPE.

Vessels inclosed in irregularly shaped patches of wood parenchyma, which are more or less united into a reticulate pattern. *Cassia fistula, C. nodosa,* and many species of *Acacia.*

3. DALBERGIA TYPE.

Vessels ringed, rather scanty, usually independent of the narrow, wavy, numerous regularly distributed bands of wood parenchyma. *Dalbergia* spp., *Pterocarpus* spp., *Dialium* spp.

4. BAUHINIA TYPE.

Numerous, regularly distributed, rather broad, concentric bands of wood parenchyma, usually inclosing the pores. *Cynometra, Crudia blancoi, Bauhinia.*

5. HARDWICKIA TYPE.

Vessels scattered, not inclosed in patches of wood parenchyma, concentric bands of wood parenchyma usually wanting. *Sindora, Hardwickia, Caesalpinia sappan.*

6. ERYTHRINA TYPE.

Vessels large, scanty, unequal, irregular. Alternate broad bands of wood parenchyma and fibers making, with the pith-rays, a tesselated pattern. *Erythrina, Butea* and *Millettia.*

These different forms may be tabulated in a key as follows:

Wood parenchyma prominent about vessels or arranged concentrically.
  Wood parenchyma in patches surrounding the vessels.
    Wood parenchyma patches not continuous..... *Ougeinia-Albizzia* type
    Wood parenchyma patches connected and forming definite pattern.
      Patches united to form reticulate pattern..... *Acacia-Cassia* type
  Wood parenchyma forming concentric lines.
    Lines narrow, wavy, numerous usually not inclosing pores..... *Dalbergia* type
    Lines moderately broad, inclosing pores..... *Bauhinia* type
    Lines very broad, wood very soft..... *Erythrina* type
Wood parenchyma not prominent..... *Hardwickia* type

OUGEINIA-ALBIZZIA TYPE.

Acacia catechu Willd. Khair (Hind.); mgenda or mgunga; the cutch tree.
Tropical Africa and Asia.

Usually considered as one of the woods of the *Hardwickia* type (see p. 469.)

Very hard and heavy, durable. Sapwood yellowish-white; heartwood either dark- or light-red. Principal use, the preparation of cutch, which is extracted from the heartwood by boiling. Railway sleepers, rice-mortars, and agricultural implements.

Watt Dict. 1:27–44; Gamb. 296–298; Nörd. IX; Van Eed. 112.

Probably some other species of *Acacia* belong to this group, but they are not of sufficient importance to be worthy of mention here.

Acrocarpus fraxinifolius W. & A. Delimas (Java).
British India, Sumatra.

Moderately hard and moderately heavy. Sapwood white; heartwood red. Used for tea-boxes and furniture.

Gamb. 290; Nörd. IX; K. & V. 1:320–323; Van Eed. 113.

Adenanthera pavonina L. "Red wood"; "Condori wood"; "coral wood"; mas-moca (Cingh.).

Tropical Asia; introduced into tropical Africa and America.

Wood hard and heavy, close-grained, durable; sapwood gray; heartwood red. Used in house building and for cabinet work. A dye is also made from the wood. A substitute for the "red sanders."

Gamb. 287; Watt Dict. 1:107; Wiesner 2:926; Ridl. 142; K. & V. 1:281–283; Holtzapffel 82; Winton 242; Van Eed. 114.

Adenanthera bicolor Moon, of Ceylon and Malacca, and *A. intermedia* Merr., of the Philippines, show the same characteristics as the preceding.

Albizzia amara Boiv.
Tropical and subtropical Asia and Africa.

Produces a pretty, heavy, and exceedingly hard wood. Heartwood purple-brown, light- and dark-banded. Said to have a transverse strength in excess of either *teak or sál*. Used for house building and for agricultural implements.

Watt Dict. 1:153.

Albizzia julibrissin Durazz.
Tropical and subtropical Asia and Africa.

Seasonal rings distinctly marked by a sharp line. Prettily marked dark-brown to black heartwood; used for furniture.

E.-Pr. 3[3]:106; Watt Dict. 1:156.

Albizzia lebbeck Benth. Siris (Hind.); ki-toke (Java); "East Indian walnut" of the London market.

Tropical and subtropical Asia and Africa to Australia.

Wood hard; sapwood white or yellowish; heartwood dark-brown, streaked with lighter or darker streaks. House and boat building, agricultural implements, furniture, and the finest cabinet work.

Gamb. 303; Watt Dict.1:157; Nörd. V (*Acacia speciosa* Willd.), IX (*Albizzia lebbeck* Benth.); Van Eed. 114; K. & V. 1:297–299; Stone 74, *pl. V, fig. 40.*

Albizzia lebbekoides Benth.
Java, Sumatra, Malay Peninsula, Philippines.

Heartwood very dark-brown.

Pierre 399; Van Eed. 115; K. & V. 1:306–308.

Albizzia littoralis T. & B. Kelor-pante (M.).
Philippines and Malaya.

Not much used.

Van Eed. 115; K. & V. 1:301–303.

Albizzia moluccana Miq. Sengon-laoet (Java).
Java and the Moluccas.

Strasburger Hist. Beitr. 3:166–176; Ridl. 143; Van Eed. 115; Bürgerstein Bericht. Deutsch. Bot. Ges. (1894) 170–172.

Albizzia montana Benth. "Caju Ticcos major;" kemlandingan (Java).
Java, Sumatra, New Caledonia, Australia.

The odor of the hard and durable wood (*lignum murinum*) attracts mice.

E.-Pr. 3[3]:106; Van Eed. 116; K. & V. 1:292–295.

Albizzia odoratissima Benth. Suriya-mara.
India, Ceylon.

Hard, very durable; sapwood white, heartwood dark-brown, brightly banded. Agricultural implements and furniture. Looks like rosewood.

E.-Pr. 3[3]:106; Watt Dict. 1:159; Stone 73, *pl. V, fig. 40;* Pierre 398.

Albizzia procera Benth. "White siris"; acleng parang (Phil.).
India and Burma, Andaman and Cocos Islands, to the Philippines.

Wood hard and moderately heavy to heavy. Sapwood large, yellowish-white, not durable; heartwood brown, shining, with alternate belts of darker and lighter color; very like that of *A. lebbek* and often indistinguishable from it. Sugar cane crushers, rice pounders, wheels, agricultural implements, bridges, and house posts. Often used in the Philippines as a substitute for *acle* (*Pithecolobium acle* (Blanco) Vid.), which it much resembles.

Gamb. 305; Watt Dict. 1:159; Nörd. XI, V (*Mimosa elata*); Van Eed. 116; Pierre 398.

Albizzia saponaria Blume. Gogong casay (Phil.).
Malaya.

Wood whitish, not durable, capable of producing a lather when rubbed with water.

Albizzia stipulata Boiv.
Tropical and subtropical Asia and Malay Archipelago.

Sapwood large, white; heartwood brown, soft. A good insect-proof wood. House building, agricultural implements, furniture, and cabinet making.

E.-Pr. 3[3]:106; Van Eed. 117; K. & V. 1:303–305.

Dichrostachys cinerea W. & A. Poeng (Java).
India.

A red, extraordinarily hard wood; valued for walking sticks and tent pegs.

Watt Dict. 3:109; Van Eed. 117; K. & V. 1:283–285.

Gliricidia sepium (Jacq.) Steud. Madre cacao; cacahuate.
Commonly cultivated and escaped in the Philippines; introduced from tropical America.

Produces an excellent wood, much like *acle*. Vessels containing yellow deposits. Used in house building and for agricultural implements. This wood furnishes a much more glistening surface when cut than does *acle*.

Intsia bijuga (Colebr.) O. Ktze. (*Afzelia bijuga* A. Gray). Plate XXIV, fig. 26. Ipil; ypil; epel; miraboo laut; merbau apil; ifi-lele (Samoa); ifil (Guam); go-mioc (Annam).
Distributed throughout the eastern tropics from Madagascar to the Sandwich Islands. A littoral tree.

Heavy and hard (sp. gr. 0.758 to 0.909). Sapwood whitish or light-yellow; heartwood dark-reddish-brown. Sent to Europe as furniture wood. Also used as a dyewood.

Wiesner 2:928; Gard. 59; Phil. Woods 384; Gamb. 280; Van Eed. 101; Watt Dict. 1:128; E.-Pr. 3[8]:140; K. &. V. 2:31–35; Pierre 388; Becc. 577; Bargagli-Petrucci 32–34, *plate VI*.

Intsia bakeri Prain (*Afzelia palembanica* Bak.). Merbau; mirabow; miraboo; "ironwood."
A very large tree of Sumatra, Borneo, the Malay Peninsula, Riouw, and Banka, growing inland.

This and the preceding, together with other species of the genus, furnish one of the best woods of the whole region. It is very much in demand for furniture, heavy structural work, bridges, corner posts of houses, telephone and electric light posts, and, in fact, anywhere that an insect- and decay-resisting wood is needed. The wood is distinguished by the copious sulphur-yellow deposits in its vessels. There is little, if anything, to choose between *ipil* and *mirabow*. The *ipil*, at least when fresh, is a shade the darker in color, otherwise the two are indistinguishable.

Van Eed. 102; Ridl. 140; Newton 4.

Ormosia calavensis Blanco. Bahay; ala-saga.
Philippines.

Moderately hard and heavy. Sapwood grayish-white; heartwood red. A very good wood, which is used locally as a substitute for *tindalo* (*Pahudia rhomboidea* (Blanco) Prain).

Other species of the genus occur in India and Malaya, but they are of only local importance.

Ougeinia dalbergioides Benth. (*Dalbergia ougeinensis* Roxb.). India.

Sapwood small, gray; heartwood mottled, light-brown, sometimes reddish-brown. Used for furniture, agricultural implements and construction. Very prominent parallel transverse markings in longitudinal sections.

Gamb. 237; Nörd. IX, VIII (*Dalbergia ougeinensis* Roxb.); Watt Dict. 5:657.

Pahudia rhomboidea (Blanco) Prain (*Afzelia rhomboidea* Vid.). Tindalo. Philippines.

Heavy and hard. Sapwood white; heartwood saffron or red, becoming very much darker with age. One of the finest furniture woods; also used for structural work, railroad ties, etc.

Gard. 62; Phil. Woods. 395.

Pahudia javanica Miq. Ki-djoelang (Java). Java and the Sunda Archipelago.

Very much like the preceding. Sp. gr. 0.70 to 0.77.

Van Eed. 106; E. Pr. 3^3:141; K. & V. 2:28–30.

Parkia roxburghii G. Don, Plate XXIV, fig. 32. Cupang (Phil.); kurayong; gudayong; kadoeng (M.).
India, Indo-China, and Malaya.

Light and soft. Light color, disagreeable odor when first cut. Not durable. Light or temporary construction, matches, shoes, boxes.

Gamb. 289; Phil. Woods 381; Gard. 69; Ridl. 142.

Parkia speciosa Hassk. Petai.
Malay Peninsula, Sumatra, Java.

Much like the preceding and used for the same purposes.

Ridl. 142; Van Eed. 119.

Peltophorum ferrugineum Benth. (*Baryxylum inerme* Pierre). Lim-vangh (Cochin China).
Andaman Islands, Ceylon, Malay Peninsula and Archipelago, Cochin China, Philippines.

Wood light-reddish-brown, soft, durable. Pores moderate-sized, often subdivided, scanty; inclosed singly, or in groups of twos or threes, in patches of wood parenchyma which often join together concentrically. Pith-rays very fine, very numerous, closely packed. Said to be very good for house building, furniture, cabinet work, and small boats.

The heartwood also gives a dye used for dyeing cloth.

Gamb. 268; K. & V. 2:3–6; Van Eed. 106; Ridl. 137; Pierre 390.

Peltophorum dasyrachis Kurz (*Baryxylum dasyrachis* Pierre). Lim-xet (Cochin China).
Indo-China, Siam, Malay Peninsula, Sumatra.

Much like the preceding and, like it, used for furniture etc., in Cochin China. Recommended for wood pavement.

Pierre 391; Jumelle 336–339.

Pithecolobium acle (Blanco) Vid. Acle.
Philippines.

Moderately heavy and hard. Sapwood whitish; heartwood dark-brown, like English walnut. Decidedly peppery odor when worked. Very fine furniture wood.

Gard. 63; Phil. Woods 369.

Other species of *Pithecolobium*, so far as seen, may be grouped here: *P. dulce* Benth; *P. acutum* Benth.; *P. lobatum* Benth., Becc. 576; *P. montanum* Benth., E.-Pr. 3³:105; *P. prainianum* Merr.; *P. scutiferum* (Blanco) Benth., and *P. subacutum* Benth.

Tamarindus indica L. Tamarind.
Africa, India, Burma, Ceylon, Malaya; widely cultivated in the tropics.

Hard and very heavy. Sapwood yellowish-white, sometimes with red streaks; heartwood dark-purplish-brown. Ripple marks on longitudinal section. Very durable, insect proof. Turnery and charcoal.

Gamb. 278; Nörd. V; Watt Dict. 6⁴:409; E.-Pr. 3³:140.

Wallaceodendron celebicum Koord. Banuyo (Phil.); kayu-besi-prempuan (M.).
Celebes and the Philippines.

Moderately heavy and moderately hard. Similar to *acle* in appearance and sometimes substituted for it.

Phil. Woods 376; Gard. 65; Koorders Meded. 's Lands Plant. 19 (1898) 446–448.

Xylia xylocarpa (Roxb.) Taub. (*X. dolabriformis* Benth.). Pyingadu; "iron-wood;" cam-xé (Cochin China).
India and Burma to Cochin China.

After teak the most important wood of Burma. Very hard and very heavy, cross-grained. Heartwood dark-brown or reddish-brown. In fresh condition, the vessels secreting an adhesive substance. Not attacked by termites. A splendid material for ship and house construction, railway sleepers, paving blocks, tent-pegs, telegraph poles, agricultural implements, carts, tool handles, piling, bridge building, etc.

Watt Dict. 6⁴:320, Agricultural Ledger (1899) no. 11, 1–21; Semler 691; Gamb. 285–287, *tab. VI, fig. 5;* Nörd. IX, IV (*Inga xylocarpa*); Boulger 123.

Sometimes said to be the same as *acle*. It is much heavier than that wood and is suited for different purposes.

ACACIA-CASSIA TYPE.

Cassia fistula L. Caña fistula (Phil.); "Indian laburnum;" sundali (Beng.).
India, China and Malaya; widespread and widely cultivated.

Wood very hard and very heavy. Sapwood large; heartwood varying in color from gray or yellowish-red to brick-red; darkens much on exposure. Durable but brittle, difficult to work, apt to splinter. The wood is distinguished from that of the otherwise similar *Ougeinia dalbergioides* by the arrangement of the parenchyma in unbroken, girdle-forming zones, while that of the last named forms distinctly divided

groups. In Java said to last longer in the ground than teak and to be untouched by insects. Posts, carts, agricultural implements, rice-pounders, bows and boat-spars and bed-plates for machinery.

Gamb. 271, *tab. VI. fig. 3;* Nörd. VIII; Van Eed. 103; Ridl. 136; Watt Dict. 2:219; K. & V. 2:11–13.

Cassia javanica L. Trenggoeli.
Malaya.

Moderately hard and heavy. Sapwood light; heartwood grayish or reddish. Used in house construction.

Van Eed. 104; E.-Pr. 3³:159; K. & V. 2:8–11.

Cassia nodosa Ham. Plate XXIV, fig. 27. Turukop bumi.
India and Malaya.

Moderately hard and moderately heavy. Sapwood light-brown; heartwood red. Not a very useful wood.

Gamb. 273; Ridl. 136.

Cassia siamea Lam. (*C. florida* Vahl). Sibusuk (M.); wa (Cing.).
Ceylon, India and Malaya.

Hard and heavy, durable. Sapwood whitish, rather large; heartwood dark-brown to nearly black, in stripes of dark and light. Wood for building, helves, walking sticks, mallets, fuel.

Gamb. 274; Van Eed. 105; Ridl. 136; Watt Dict. 2:223.

Cassia timorensis DC. Anemene.
India, Malaya, Australia.

Very hard and heavy. Dark-brown, nearly black—much resembling the wood of *C. siamea.* Used for house building and furniture.

Gamb. 274; Van Eed. 105; Watt Dict. 2:224; K. & V. 2:13–15.

Prosopis spicigera L. Jhand.
British India.

Wood very hard and very heavy. Sapwood large, whitish, perishable; heartwood purplish-brown. Firewood. Structural work, furniture. Not durable.

Gamb. 288, *tab. VI, fig. 6;* Nörd. VIII; Watt Dict. 4:341.

DALBERGIA TYPE.

Ripple marks on tangential surface.

Dalbergia cultrata Grah. Yindaik.
Burma.

Very hard and very heavy. Sapwood pale-brown; heartwood black with dark-purple streaks.

Watt Dict. 3:6.

Dalbergia latifolia Roxb. "Indian rosewood;" "blackwood" in southern India.

British India, Java, Andaman Islands.

Wood very hard and very heavy. Sapwood yellow, small; heartwood dark-purple, with black longitudinal streaks. Wood with distinct rose-like odor. The best wood of India for furniture and cabinet work. Exported to the London market. Seems to be the material used in the manufacture of blackwood furniture in Hongkong and Canton.

Gamb. 250–252, *tab. VI, fig. 1;* Nörd. VII; Van Eed. 94; Stone 63, *pl. V. fig. 37;* Watt Dict. 3:9; E.-Pr. 3³:336; K. & V. 2:77–82; Holtzapffel 83.

Dalbergia oliveri Gamble. Tamalan.

Burma.

Hard and very hard, close-grained. Sapwood white; heartwood dark-red-brown, in color like good *padouk*. A very handsome wood very like some of the South American rosewoods. It is used for ax handles.

Gamb. 256.

Dalbergia sissoo Roxb. Sissu.

British India.

Very hard and heavy. Sapwood small, white; heartwood brown, with darker longitudinal veins. Shipbuilding and furniture.

Gamb. 247–249; Nörd. IV; Watt Dict. 3:15; E.-Pr. 3³:336; Holtzapffel 106.

Dialium indum L. Kranji.

Java.

Very hard and heavy wood, durable. Heartwood usually of a reddish color. Used for heavy structural work and in places where great strength and hardness are required. A number of other species of *Dialium* occur in British India, the Malay Peninsula and the Malay Archipelago. They usually occur as scattered individuals.

Newt. 5; Ridl. 138; E.-Pr. 3³:155; Gamb. 275; Van Eed. 105; Bargagli-Petrucci 30–32, *tab. VI.*

Koompassia beccariana Taub. Kumpas; mingris.

Borneo.

Very hard and heavy; pale-reddish, not durable.

Bargagli-Petrucci 28–30; Becc. 577.

Koompassia excelsa (Becc.) Taub. (*Abauria excelsa* Becc.). Tapang; kayu rajah; mangaris.

Borneo.

Very heavy and very hard. Sapwood yellowish-white; heartwood dark-red, becoming almost black with age. The buttresses of this tree are used for table tops. Wood used for carving paddles and for making the pans used in the hand washing of gold. Strong but very brittle.

Becc. 576; Bargagli-Petrucci 24, *pl. VI.*

Koompassia malaccensis Maingay. Kumpas.
Malay Peninsula.

Reddish, very hard and moderately heavy, coarse-grained, not durable. Charcoal.

Newt. 5; Ridl. 137; E.-Pr. 3³:156.

Koompassia parviflora Prain. Tualang or sialang (M.).
Malay Peninsula.
Ridl. 138.

Pterocarpus. Wood hard to very hard, moderately heavy to very heavy; yellowish-brown, red, or purplish-red. Pores variable, small to large, scanty, in patches of wood parenchyma joined by more or less fine, wavy, concentric lines of the same tissue. Pith-rays very fine, uniform, equidistant. In color, the different species differ; *P. santalinus* has its wood of a very dark claret-red color; *P. indicus* and *P. macrocarpus* of a dark brick-red color; *P. dalbergioides* has a bright-red wood, often streaked with black; while the wood of *P. marsupium* is of a brown color with a yellowish tinge. All the species are valuable as furniture and ornamental woods and all contain a certain amount of a substance which gives them an aromatic odor.

Pterocarpus dalbergioides Roxb. "Andaman redwood" or Andaman padauk.
Andaman Islands.

Wood moderately hard and heavy; sapwood gray, small; heartwood bright-red, streaked with brown and black. Pores scanty, moderate-sized to large, filled with resin, surrounded with pale rings and joined by narrow, wavy, concentric lines of wood parenchyma. Pith-rays very fine, very numerous, uniform and equidistant. *Padauk* is used in Europe and America for furniture, parquet-floors, railway carriages, door-frames, balustrades, etc. Most successfully used in the building of Pullman cars in America. One of the most important export furniture woods of the whole region.

Gamb. 257–259; Van Eed. 97.

Pterocarpus echinatus Pers. Narra (Phil.).
Philippines and Celebes.

Much like the preceding.

Phil. Woods 390.

Pterocarpus hypostictus Miq. Tarpandi.
Sumatra.

Masts.

Van Eed. 97.

Pterocarpus indicus Willd. Plate XXIV, fig. 28. Narra (Phil.); angsana (M.).

Southern India to the Malay Archipelago and southern China, Philippines.

Heartwood of a splendid red; moderately hard and with slightly aromatic odor, durable, not attacked by termites, easily worked and polished. Furniture and wagon building.

Watt Dict. 6[1]:356; E.-Pr. 3[3]:341; Ridl. 135; Culbertson in Bot. Gaz. 21 (1894) 498; Gamb. 257; Van Eed. 98; Gard. 57; Phil. Woods 390; K. & V. 2:83–88; Stone 75, *pl. V, fig. 41;* Stevenson 247–249; Becc. 576.

Pterocarpus macrocarpus Kurz. Padauk; padu; padoo; "inland padauk."

India and Burma.

Produces a very hard and very heavy wood. The wood of roots and stem-knots resembles dark mahogany, and is made up into small boxes.

Culbertson Bot. Gaz. 21 (1894) 498; Gamb. 259.

Pterocarpus marsupium Roxb. Biji (Hind.); gammala (Cing.).

India and Ceylon.

The brown- and dark-striped, very hard, durable and easily polished wood serves for window frames, posts, furniture, agricultural implements, wagon and boat building, and railroad ties. The heartwood is full of gum resin and stains yellow when damp.

Watt Dict. 6[1]: 357; Nörd. X; Gamb. 261, *tab. VI, fig. 2.*

Pterocarpus santalinus L. f. East Indian sandalwood; red sanders; caliaturholz.

Southern India.

Wood very hard and very heavy; sapwood white, heartwood dark-claret-red to almost black, but always with a deep-red tinge, orange-red when first cut, the shavings giving an orange-red color. Used for house posts, agricultural implements, carved work, and dyewood. The value of redwood as a dye is due to a red coloring principle, "santalin," which is soluble in alcohol and ether, but not in water. Dissolved in alcohol, it dyes cloth a beautiful salmon-pink color.

Van Eed. 99; Wiesner 2:937–939; Gamb. 259; Holtzapffel 103.

BAUHINIA TYPE.

Bauhinia acuminata L.

India Malaya, China.

Produces the pretty and durable "mountain ebony."

E.-Pr. 3[3]:149.

Bauhinia malabarica Roxb. Alabangbang (Phil.).

India and Burma to Cochin China, the Philippines, and Malaya.

Moderately hard and moderately heavy. Not very durable. Prominent parallel transverse lines on tangential section. Wood rather poor quality. Fuel.

Gamb. 282; Van Eed. 102; K. & V. 2:24–26; Pierre 400.

Bauhinia purpurea L.
India, Ceylon, Java.

A moderately hard structural wood.

Watt Dict. 1:422; E.-Pr. 3³:151; Gamb. 283, *tab. VI, fig. 4;* Nörd. X.

Bauhinia retusa Ham. Semla.

Wood hard and very heavy, red, with irregular dark-red or black patches and streaks near the center.

Gamb. 282; Nörd. X.

Bauhinia tomentosa L.
India and Ceylon to China and the Malay Archipelago; Africa.

The firm white wood is used for handles and sheaths for weapons.

E.-Pr. 3³:149.

Bauhinia variegata L.
India and China.

Gray, moderately hard wood, used in making agricultural implements.

Watt Dict. 1:426; E.-Pr. 3³:151.

Crudia blancoi Rolfe. Big-biga.
Philippines.

Hard and heavy, not durable. Used locally in house building.

Cynometra inaequifolia A. Gray. Bulankan; melankan katong (M.).
Philippines and the Malay Peninsula.

Hard and heavy, durable. House building.

Ridl. 139.

Cynometra ramiflora L. Shungra (Beng.); myinkabin (Burm.); gal mendora (Cing.).
Southern India and Ceylon to Burma and the Andaman Islands.

Wood red, hard, close-grained, very heavy. House and cart building.

Pierre 389; Watt Dict. 2:682; Gamb. 275; K. & V. 2:49–51.

Derris cumingii Benth. Malacadios.
Philippines.

Hard and heavy, light-colored, durable. House building, etc.

Derris robusta Benth. (*Deguelia robusta* Taub.).
India and Burma.

Wood light-brown, hard and heavy. Tea chests.

Gamb. 263; Watt Dict. 3:81.

Pongamia glabra Vent. (*Galedupa pinnata* Taub.) Bansu (M.).
Tropical forests, Ceylon to Australia.

White, turning yellow on exposure. Moderately hard and moderately heavy. Not durable. Very distinct transverse markings on longitudinal section.

Watt Dict. 3:81; Gamb. 262; Ridl. 135; Van Eed. 97; K. & V. 2:93–96; Bargagli-Petrucci 22, *tab. V;* Becc. 576.

Millettia pendula Benth. Thinwin (Burm.).
Southern India and Burma.

Dark-colored, purplish-black, prettily marked, dense, very heavy and hard wood. Agricultural implements.

Watt Dict. 5:247; E.-Pr. 3³:271; Gamb. 233.

Other species are also used, but they do not seem to furnish much wood, and the quality of the wood is indifferent.

Pericopsis mooniana Thw., Plate XXIV, fig. 25.
Ceylon.

Pale-orange-brown, streaked with darker hues. Hard, heavy, smooth, with very pretty grain. Furniture, carts, etc. The finest furniture wood in Ceylon.

Gamb. 265.

HARDWICKIA TYPE.

Acacia arabica Willd. Babul (Hind.).
Tropical Asia and Africa.

An excellent, durable, extensively used wood. Hard and heavy; sapwood large, whitish; heartwood pinkish-white, turning reddish-brown on exposure, mottled with dark streaks. Vessels with red deposits. Agricultural implements, cart wheels, house building, furniture, fuel and charcoal. When used for furniture the timber is carefully seasoned in water.

Watt in Agric. Ledger (1902) 2:73; Gamb. 292; Nörd. XI; F. v. Mueller 2; Van Eed. 111.

Acacia catechu Willd. Khair (Hind.).
British India, Burma, and Ceylon; tropical Africa.

Sapwood yellowish-white, heartwood either dark- or light-red, extremely hard and very heavy. Seasons well, takes a fine polish and is extremely durable. Used for all kinds of agricultural implements, bows, spears, sword-handles, and wheelwright work. Employed for house boats in Burma and very largely used as fuel for the steamers of the Irawaddy flotilla. The fuel of dead *khair* is much valued by goldsmiths. Said to be good for railway sleepers. Said to be proof against the attack of teredo and termites. The chief product of the tree is the cutch, which is extracted from the heartwood by boiling.

Watt in Agric. Ledger (1902) 2:80; Gamb. 296–298; Van Eed. 112.

Acacia eburnea Willd.
India and Ceylon.

Hard and heavy. Yellowish-white, often with a red heartwood. Used only as fuel.

Gamb. 294; Nörd. IX.

Acacia excelsa Benth.
East Australia.

Produces a kind of rosewood (E.-Pr. 3³: 110), which is also called "ironwood" (G. A. Blits Bull. Kol. Mus. Harlem **19** (1898), and is used

for construction and furniture (F. Mueller, Select Extra-tropical Plants (1881) 1).

Acacia ferruginea DC. Ironwood.
India.
Blits l. c.; Gamb. 298; Watt Dict. 1:50.

Acacia farnesiana Willd. Ironwood.
Throughout the tropics; original home uncertain.

Acacia koa Gray. Koa wood.

The most important furniture wood of the Hawaiian Islands.

Acacia leucophloea Willd. Pilang (M.).
British India, Ceylon, Burma, Malay Archipelago.

Wood hard and heavy; sapwood large; heartwood reddish-brown with lighter and darker streaks. Seasons well, takes a good polish, but is often eaten by insects. Fuel.

Gamb. 295; Watt Dict. 1:52; Van Eed. 112; K. & V. 1:286–289.

Acacia melanoxylon R. Br. Plate XXIII, fig. 23. Black wattle.
Southeastern Australia; naturalized in India.

Soft to moderately hard and moderately heavy. Sapwood light brown; heartwood dark brown and beautifully mottled, shining, even-grained. Fine furniture and veneer, also carriage building.

E.-Pr. 3[3]:110; Semler 620; Watt Dict. 1:53; Gamb. 301; Hough Amer. Woods 7:155; Stone 81, pl. V, fig. 44.

Acacia modesta Wall.
Himalaya, Punjab.

Beautiful, dark-brown, black-striped heart. Very hard, firm and durable. Wheels, sugar presses, agricultural implements, etc.

Watt Dict. 1:53.

Acacia planifrons W. & A.
India.

Agricultural implements.

Watt Dict. 1:54.

Acacia tomentosa Willd. Klampis (M.).
British India, Ceylon, and Malaya.

Hard and heavy, but not durable. Used only for fuel.

Van Eed. 112; K. & V. 1:289–291.

Caesalpinia sappan L. Plate XXIV, fig. 31. Sappan wood; sibucao (Phil.).
India and Ceylon to Malaya and the Philippines, widely cultivated.

Very hard and heavy. Sapwood white, heartwood dark orange-yellow. Fine-grained, takes a fine polish; useful for cabinet work and inlaying, but chiefly used for dyeing. (See p. 425.)

Gamb. 267; Wiesner 2:934; Van Eed. 103; Ridl. 137; Stone 70; Holtzapffel 105.

Hardwickia binata Roxb. Anjan.
Southern India.

Very hard and very heavy. One of the hardest and most durable of Indian woods. House and bridge building and cabinet work.

Gamb. 276; Nörd. XI; Watt Dict. 4:13.

Kingiodendron alternifolium (Elm.) Merr. & Rolfe (*Hardwickia alternifolia* Elm.). Plate XXIV, fig. 29. Batete.
Philippines.

Moderately heavy and hard. Reddish-brown, much stained by the oil contained in the wood. Easily worked, but not very durable. Used for furniture and house building.

Phil. Woods 275.

Kingiodendron pinnatum (Roxb.) Harms. (*Hardwickia pinnata* Roxb.) Kolavu.
British India.

Moderately hard and moderately heavy. Sapwood large; heartwood dark-red or reddish-brown, exuding a red sticky resin. Building.

Gamb. 277.

Sindora cochinchinensis Baill. Plate XXIII, fig. 24. Cay-go; go-mat; go ta-hi.
Cochin China.

Uncommonly hard, black or dark-brown, and valuable wood. Used wherever strength and durability are desired. One of the most valuable woods of Cochin China; very fine furniture, house posts, bridges, boats, carriage building. Most valuable for cabinet work because of its very fine color and the ease with which it polishes.

E.-Pr. Nachtr. 195; Pierre 385.

Sindora intermedia Baker. Petir; sapetir.
Borneo.

Wood hard and moderately heavy; light reddish-brown. House building; said to be very durable.

Sindora sumatrana Miq. Sindoer; saparantu; sapetir.
Borneo, Sumatra, Malay Peninsula.

Moderately hard and moderately heavy. Sapwood rather large; heartwood reddish or yellowish-brown, with occasional lines marked by oil. Said to be quite durable. Used in house construction. Oil collected by use of fire.

Van Eed. 108; K. & V. 2:45–47.

Sindora supa Merr. Supa.
Philippines.

Dark brownish-yellow, heavy and hard. Wood used for furniture and construction. Oil collected as in the preceding.

Gard. 60; Phil. Woods 393.

Sindora wallichiana Benth. Saputi.
Straits Settlements and Federated Malay States.
Prain in Journ. As. Soc. Beng. 66² (1897) 480–483; Ridl. 140.

Sophora tomentosa L. Ki-koetjing (M.).
Malay Archipelago.

Wood hard and heavy, dark-grayish or purplish, not much used.
K. & V. 2:100.

ERYTHRINA TYPE.

Butea frondosa Roxb. Palas (Sanskrit); Plasa (Java).
India, Burma, Ceylon, Malay Archipelago.

Soft and light, not durable. Gray or gray-brown, white or brown if cut up fresh and quickly seasoned. Durable in water. Boxes.
Gamb. 243; Van Eed. 94; K. & V. 2:72–75.

Erythrina indica Lam. Plate XXIV, fig. 30. Dapdap; dadap.
India to Australia; much planted.

Very soft and easily lacquered. Used for knife sheaths, toys, etc.
Watt Dict. 3:269; Gamb. 242; K. & V. 2:58–61.

Erythrina suberosa Roxb. Pangia (Hind.).
Himalaya.

White, very soft wood, used for sheaths, planks, etc.
Watt Dict. 3:270; Gamb. 241.

OXALIDACEÆ.

Averrhoa carambola L.

Widely cultivated throughout the tropics.
Wood bright-red, hard; used for structural work and furniture.
Watt Dict. 1:359; Van Eed. 54; Janssonius 2:9.

Averrhoa bilimbi L. Blimbing.
Same range as the preceding.

Grayish, soft, little used.
Van Eed. 53; Janssonius 2:13.

Connariopsis spp. Pianggu.
Borneo and the Malay Archipelago.

Small trees with white and moderately soft wood.
Becc. 573; Bargagli-Petrucci 34, *tab. VII.*

LINACEÆ.

Ixonanthes icosandra Jack. Plate XXIV, fig. 33. Pagar anak (M.).
Malay Peninsula.

Hard and heavy, yellowish-brown; used for piling, construction, etc.
Ridl. 95.

ERYTHROXYLACEÆ.

Erythroxylum cuneatum (Wall.) Kurz. (*E. burmanicum* Griff.) Medang; lagundi; chintah; mulah.

Malay Peninsula and Archipelago, Philippines.

Wood heavy and compact, dark-red or brown with distinct but irregular rings; rays very fine and numerous; pores copious and small. A good ordinary building timber.

Ridl. 95.

RUTACEÆ.

Vessels and pith-rays fine; very even-grained woods.

Ægle marmelos (L.) Correa. "Bel fruit tree;" "Bengal quince."

British India and Burma; widely cultivated.

Yellowish-white hard and heavy wood, which has a sharply aromatic odor when fresh; not durable. Seasonal rings marked by distinct lines, and often by a continuous belt of pores. Construction, pestles of oil and sugar mills, naves and other parts of carts, and agricultural implements.

Watt Dict. 1:123; Gamb. 131, *tab. II, fig. 5;* Nörd. IX; Van Eed. 54; Janssonius 2:69.

Atalantia monophylla (L.) Correa.

British India to Tenasserim, Ceylon.

Yellow, very hard and heavy wood, with numerous annular zones marked by bright lines. A boxwood substitute. The wood much resembles that of *Murraya exotica.* Used for engraving, cabinet work, and turning.

E.-Pr. 3[4]:192; Watt Dict. 1:349; Gamb. 129.

Atalantia missionis (Wight) Oliv.

British India and Ceylon.

The moderately hard, yellowish-white wood with distinct seasonal rings is used for furniture and cabinet work.

E.-Pr. 3[4]:192; Watt Dict. 1:349; Gamb. 129.

Chloroxylon swietenia DC. Plate XXIV, fig. 34. East Indian satinwood.

British India and Ceylon.

Hard and very heavy; pale yellow with a satiny sheen when smoothed; very durable. Furniture and picture frames. Used locally for railroad ties and general construction work. With distinct parallel transverse lines on tangential section. (See p. 433.)

Wiesner 2:953; Gamb. 160–162; Nörd. X; Stone 29–31; Van Eed. 67; Brown in Trop. Agric. 19 (1899) 118.

Very similar to the West Indian satinwood (*Fagara flava* (Vahl) Krug & Urb.), which belongs to the same family.

Citrus aurantium L. The orange; limau manis (M.).
British India; cultivated throughout the tropics and subtropics.

Wood yellowish-white. Pores small, scanty, joined by white tangential lines, which occasionally join, forming concentric circles. Used in carving small ornaments.

Gamb. 130; Nörd. IV; also XI (*C. vulgaris* Risso, and *C. nobilis* Lour.); Ridl. 96; Van Eed. 55.

Other species of the genus show similar structure and are similarly used.

Feronia elephantum Correa. "Elephant" or "wood-apple;" kapittha; bilin.
India, Ceylon.

Yellowish-white, hard, structural wood.

E.-Pr. 3[4]:193; Watt Dict. 3:327; Gamb. 131; Nörd. IX.

Flindersia amboinensis Poir.
Moluccas (Ceram).

Produces a good wood for some purposes.

Murraya exotica L. Plate XXIV, fig. 36. Camuning; kamuning (M.).
British India, Burma, Malay Peninsula and Archipelago, Philippines.

Bright-yellow, very hard and very heavy, similar to boxwood and said to be a suitable substitute for it. Used for canes, kris handles and carvings.

Watt Dict. 5:288; Gamb. 125; Ridl. 96; Van Eed. 57; Janssonius 2:51.

Murraya koenigii (L.) Spr.
Himalaya, Bengal, and Ceylon.

Grayish-white, hard, durable wood; serves for agricultural purposes.

Watt Dict. 5:288; Gamb. 126.

Murraya paniculata Jack. Satinwood; cosmetic-bark tree.
British India, Burma, Java, Sumatra, New Guinea.

The bright yellow, firm, durable wood is used for cabinet work.

E.-Pr. 3[4]:188.

Other *Rutaceæ* which may possibly furnish substitutes for boxwood are species of *Micromelum, Limonia, Triphasia, Paramignya, Tetractomia, Fagara* (Plate XXIV, fig. 35), *Melicope, Pelea, Lunasia, Glycosmis,* and *Thoreldora.*

SIMARUBACEÆ.

Ailanthus malabarica DC.
British India and Ceylon.

Wood for dishes and tea chests.

Lewis 307; Janssonius 2:81.

Irvingia malayana Oliv. Plate XXV, fig. 37. Pauh kijang (M.).
Malacca.

A hard, heavy and readily worked wood; very straight-grained.

Pierre 263.

Irvingia oliveri Pierre, of Cochin China, is used for the same things as the above. Other genera needing investigation are *Samadera, Simaruba, Quassia, Eurycoma, Brucea, Picrasma,* and *Soulamea.*

BURSERACEÆ.

Wood soft to moderately hard (*Filicium* very hard). Pores small or moderate-sized, uniformly distributed. Pith-rays fine, distant.

Balanites aegyptica Delile.
Senegambia, through north tropical Africa to India and Burma.

Yellowish-white to golden-brown, beautifully marked, hard, heavy wood; used for furniture and walking sticks.

E.-Pr. 3⁴:355; Watt Dict. 1:363.

Boswellia serrata Roxb. Guggar.
British India.

Wood moderately hard, light or moderately heavy, smooth; sapwood white; heartwood brown (dark greenish-brown), sometimes very small, so that the wood has been described as white; but, when present, rather handsome, often streaked in darker and lighter bands. Pores scanty, moderate-sized, often subdivided and often containing resin. Pith-rays moderately broad, very short, not very numerous. Not very durable. Used for structural work and fuel.

Gamb. 137, *tab. III, fig. 1;* Nörd. VIII.

Bursera serrata Colebr. (*Protium serratum* Engl.)
British India and Burma.

Wood hard, moderately heavy; sapwood light-brown; heartwood red, close-grained. Pores small, uniformly distributed. Pith-rays fine, red, numerous. Used for furniture.

Gamb. 140.

Canarium commune L. Plate XXV, fig. 38. "The Java almond;" pili (Phil.).
Malay Peninsula and Archipelago, cultivated in British India and Ceylon.

Wood soft and light to moderately heavy; grayish-white, soft, smooth; pores moderate-sized, scanty. Pith-rays brown, moderate-sized, not numerous. Light or temporary construction.

Gamb. 141; K. & V. 4:30–33; Van Eed. 60; Janssonius 2:108.
Many other species of *Canarium* are used for light or temporary construction work, as the wood is soft and easily worked.
Lewis 307.

Filicium decipiens Thw.
British India and Ceylon.

Wood very hard and very heavy; heartwood red. Pores small, in groups or short radial lines. Pith-rays fine, numerous, at unequal distances. A strong structural timber.

Gamb. 142.

Garuga pinnata Roxb. Kharpat.
Northwestern India.

The reddish-gray, very heavy, but not durable wood, with darker heart, serves for interior finishing and cabinet work.

Watt Dict. 3:484; Gamb. 138; Nörd. IX; Janssonius 2:87.

Protium javanicum Burm. Trengaloen.
Java.

Hard and heavy; sapwood whitish, small; heartwood reddish-brown, fine-grained. Pores moderate-sized, evenly scattered. Pith-rays very small. A good strong and durable structural timber.

K. & V. 4:22–25; Van Eed. 61; Janssonius 2:93.

Santiria oblongifolia Bl.
Malay Peninsula, Sumatra, Java, Borneo.

Wood grayish, not hard and not very durable; used for temporary construction.

K. & V. 4:26–28.

Trigonochlamys griffithii Hook. f. Kadondong mata hari; kijai; kumpai ruman (M.).
Malay Peninsula.

Wood dark-yellow, red, or yellowish-white, grain medium, fairly hard, heavy; does not split; durable; used in house building.

Ridl. 99.

MELIACEÆ.

Wood usually red, sometimes yellow or gray, more rarely white, sometimes with irregular concentric bands of loose texture. Pores various, rather scanty, generally moderate-sized. Pith-rays usually moderate-sized.

Aglaia. Wood usually red or reddish-brown, hard to very hard and heavy. Seasonal rings often distinct; sometimes ring-porous. Pores small to medium size, often connected by concentric wavy lines of wood parenchyma. Pith-rays fine, numerous, evenly distributed.

Aglaia clarkii Merr. Plate XXV, fig. 39. Tucan-calao.
Philippines.

Hard and heavy, durable. Furniture and structural work.

Phil. Woods 395.

Aglaia eusideroxylon K. & V. Lotong; langsat-loetoeng (Jav.); ijzerhout (Dutch).
Java.

Extremely hard and heavy, aromatic, dark red, durable. Used for house and bridge building.

K. & V. 3:128–132; Van Eed. 62.

Aglaia minahassae Koord. Pisek; malinsot; ijzerhout.
Celebes, Ceram, Saparoea, Haroeka, Noesalant.

Possibly the same as the preceding species; house and bridge building.

Van Eed. 62; Blits 30–32.

Aglaia odorata Lour.
China and the Indo-Malayan region.

A very good wood for cabinet work.

Aglaia pyramidata Hance. (*A. cochinchinensis* Pierre).
Cochin China.

Dark red wood, hard, agreeable odor, durable. Used for planks and furniture.

Pierre 334.

Aglaia roxburghiana Miq.
Java, Sumatra, Moluccas, Ceylon, Burma.

Hard and very heavy, bright red. Used for spokes.

Van Eed. 63; K. & V. 3:147; Gamb. 149.

Amoora. Wood hard, close-grained, red, with a darker-colored heartwood. Pores small to large, often subdivided, visible or prominent on vertical section. Pith-rays moderately broad, uniform.

Amoora aherniana Merr. Plate XXV, fig. 40. Cato.
Philippines.

Dark red; very hard and very heavy. Used for structural work. Vessels with whitish diaphragms or deposits which show very plainly on the longitudinal section. Occasional dark-red deposits in vessels.

Amoora cucullata Roxb.
Indo-Malayan region.

Red, hard, heavy wood. Pores joined by narrow concentric lines of wood parenchyma.

Pierre 344; Gamb. 151; Watt Dict. 1:224.

Aphanomyxis grandifolia Bl. (*Amoora aphanomyxis* R. & S.). Goela (Jav.).
Java, Banka, Timor, Malay Peninsula.

Wood moderately hard and heavy, pale red, not durable, does not split readily. Not much used.

Van Eed. 63 K. & V. 3:119–123.

Aphanomyxis rohituka (Roxb.) Pierre.
Indo-Malayan region.

Red, hard, and heavy wood, with concentric bands in cross-section. Boat building.

Watt Dict. 1:224; Pierre 344.

Azadirachta indica A. Juss. Neem; "margosa tree;" "margosier."
India and Ceylon, Malaya; also in east Africa. Often planted.

The mahogany-like, very hard and resistant, strongly scented wood is used by carriage makers, carpenters and joiners, and also in ship-building.

E.-Pr. 3[4]:288; Watt Dict. 5:221; Van Eed. 71; K. & V. 3:21–24.

Chisocheton. Wood moderately hard or soft, light. Pith-rays distinct; vessels of medium size or large, often divided; wood parenchyma in very regular concentric lines.

Chisocheton philippinus Harms. Malatumbaga.
Philippines.

Not durable and not much used.

Chisocheton divergens Bl. Garonton tangah (M.).
Malay Peninsula.
Ridl. 100.

Chukrassia (Chickrassia) tabularis A. Juss. "Bastard cedar;" "East Indian mahogany;" "white cedar;" "Indian redwood;" "Chittagong wood."
British India to southern China; widely distributed.

Hard and heavy, yellowish to reddish-brown, with a beautiful satiny luster. Seasons and works well. Sapwood of a lighter color. Pores scanty, moderate-sized, often oval and subdivided, isolated, uniformly distributed. Pith-rays fine, uniform, mostly equidistant, slightly undulating, distance between the rays generally equal to the transverse diameter of the pores. Seasonal rings distinctly marked by a sharp line. Fine silver grain with a satiny luster. Like *Soymida,* it is difficult to plane owing to the fibers running in different directions. Used in making fine furniture.

Gamb. 156; Nörd. X; E.-Pr. 3[4]:273; Watt Dict. 2:268; Semler 631; Ridl. 101; Pierre 357.

(See p. 430.)

Cipadessa fruticosa Bl.
India, Ceylon, Java.

Wood red, hard, heavy, with a faint odor resembling that of *toon* wood. Pores prominent as red lines on a vertical section. Seasonal rings marked by a white line.

Gamb. 146.

Dysoxylum. Wood reddish, rough, moderately hard. Pores prominent on a vertical section, moderate-sized to large, often subdivided, or in short strings. Pith-rays fine. Concentric lines in some species fairly prominent.

Dysoxylum amooroides Miq.
New Guinea, Java.

Wood for matches.

Wiesner 2:96; Janssonius 2:153.

Dysoxylum binectariferum Hook. f.
British India and Ceylon.
Gamb. 147; Nörd. IX.

Dysoxylum hamiltonii Hiern.
British India.

Used for planks and for small boats.

Gamb. 148, *tab. III, fig. 3;* Nörd. X.

Dysoxylum turczaninowii C. DC. Agaru.
Philippines.

A very ornamental wood known as *agaru* is furnished by this and other species of the genus and possibly also by some species of *Chisocheton.* The wood is light-colored, fine-grained, hard and moderately heavy and takes a beautiful finish like that of satinwood. Used for fine furniture and frequently found in the Manila market.

Epicharis loureiri Pierre (*Dysoxylum loureiri* Pierre). Huynduong or "sandal."
Cochin China, Province of Thu-dau-mot.

A very fine wood for the construction of coffins, knicknacks, and wood carving, also ground up into a powder and used in pharmacy. The wood has an odor resembling that of sandalwood and it is used as a substitute for sandalwood in incense, etc.

Jumelle 338; Pierre 352.

Lepidaglaia bailloni Pierre (*Dysoxylum bailloni* Pierre).
Burma and Indo-China.

Carriage work and turnery. Sometimes sold as sandalwood.

Pierre 352; Wiesner 2:910.

Melia azedarach L. "Persian lilac;" "bead tree;" "lilac des Indes;" "sykemore;" "Laurier grec."
Much cultivated in the warmer parts of the whole world.

Sapwood yellowish-white, heartwood reddish, very easily polished and worked; serves mainly for furniture.

K. & V. 3:12–17; Watt Dict. 5:223; Gamb. 144; Nörd. VI; Hough Amer. Woods 5:105; Janssonius 2:128; Stone 31; Van Eed. 71.

Melia dubia Cav. "White cedar."
East Indies.

Reddish heart; soft and light wood. Structural work and the making of shelves and tea-chests.

Watt Dict. 5:223; Lewis 308.

Melia indica Brandis.
British India and Burma.
Gamb. 143, *tab. III, fig. 2;* Nörd. V (*M. azedarach*); Stone 31.

Pseudocarapa championii Hemsl.
Ceylon.

Wood very much like that of *Amoora*.
E.-Pr. 3⁴:297.

Sandoricum indicum Cav. Plate XXV, fig. 42. Santol; "wild mangosteen."
Indo-Malayan region, Mauritius.

Sapwood gray; heartwood red, moderately hard, close grained. Takes a beautiful polish. Pores small, oval or subdivided. Pith-rays fine, undulating, not prominent. Wood with a faint camphor-like odor when fresh. Easily worked; suitable for the making of models.

Gamb. 149; Watt Dict. 6²:458; Phil. Woods 392; Van Eed. 72; K. & V. 3:27–30; Janssonius 2:131; Becc. 574; Pierre 353.

Sandoricum vidalii Merr. Malasantol.
Philippines.

Wood harder and heavier than the preceding. Sapwood white or pinkish; heartwood brownish-red. Used for general construction purposes, small boats, roof timbers, etc.

Gard. 60; Phil. Woods 388.

Soymida febrifuga A. Juss. "Bastard cedar;" "redwood de Coromandel;" "Indian redwood;" "East Indian mahogany;" rohan.
India and Ceylon.

Sapwood small, whitish; heartwood extremely hard and close-grained, very dark, red-brown, very durable, with numerous fine, concentric lines of lighter color, often closely packed. Pores moderate-sized, scanty. Pith-rays moderately broad, distinctly visible on a radical section as dark shining plates, making, with the sections of the dark pores, a very pretty silver grain having a satiny luster. Wood somewhat cross-grained, like *sál* and some others, owing to the fibers in different vertical layers going in different directions, so that it is difficult to plane. Very hard and heavy. Fine furniture, etc., wood carving in temples.

Watt Dict. 6³:318; E.-Pr. 3⁴:272; Gamb. 155.
(See p. 430.)

Sphaerosacme spectabilis Wall. (*Amoora wallichii* King; *A. spectabilis* Miq.?).
Eastern Assam and Burma.

The reddish, hard, durable, very readily polished wood is worked up into boats and furniture.

Gamb. 151; Watt Dict. 1:225.

Swietenia mahagoni L. Mahogani; acajou.
West Indies and Central America; also planted and doing well in India.

Hard and heavy; bright or dark cinnamon-brown to reddish-brown, either uniform in color or well marked. Parallel transverse lines very prominent in longitudinal section. Principal uses, furniture and cabinet work. (See p. 430.)

Wiesner 2:959; Gamb. 153–155; Stevenson 225–239; Stone 32.

Swietenia macrophylla King.
Introduced from the West Indies. Grows well in cultivation in this part of the world.

Wood moderately hard and moderately heavy.

Gamb. 155.

Toona. Wood pale reddish, light and soft, ring porous and with distinct cedary odor.

Toona serrata (Royle) Roemer (*Cedrela serrata* Royle). "Toon tree;" "Indian mahogany;" "Moulmein cedar;" "cedre rouge;" "cedre de Singapore."
India.

Light, shining, soft but durable; termite proof. A very valuable wood, used for furniture, framing, wood carving, tea-chests, cigar boxes.

Watt Dict. 2:232; Lewis 307; Gamb. 160, *tab. III, fig. 6* (*Cedrela serrata* Royle); Nörd. IX (*Cedrela serrata* Royle); Van Eed. 66; K. & V. 3:204–207; Stone 37; Holtzapffel 108.

Toona ciliata Roem. (*Cedrela toona* Roxb.). Toon; "Moulmein cedar;" "Indian mahogany."
British India and Burma.

Wood durable, termite proof, and used for all kinds of furniture.

Gamb. 157–159, *tab. III, fig. 5;* Nörd. IV; Stone 37; Watt Dict. 2:233.

Toona febrifuga (Bl.) Harms (*Cedrela febrifuga* Bl.). Soeren.
Burma, Cochin China, Java, etc.

Structure and uses much the same as in the preceding.

Van Eed. 65; K. & V. 3:197–204; Pierre 358.

Toona calantas Merr. & Rolfe. Plate XXV, fig. 41. Calantas.
Philippines.
Phil. Woods 379; Gard. 61–62.

Very much like *Toona febrifuga* (Bl.) Roem.
Several other closely related species of the genus are found in the range and their use and structure is much the same as that indicated for the species named. The genus is very closely allied to the American *Cedrela*.

Xylocarpus. Wood dark, red, hard and heavy. Concentric lines of wood parenchyma seeming to mark regions of growth. Pores medium-sized to small, scattered. Pith-rays fine.

Xylocarpus obovatus A. Juss. (*Carapa obovata* Bl.) Nigue; nigi; tabigue (Phil.); niri; nireh (M.).

East Africa to the Fiji Islands, in mangrove swamps.

Wood very fine-grained and durable. Finishes well and is often used for fine furniture. It shrinks very little and is often made into furniture while still very fresh; used also for sandals. An excellent firewood.

Becc. 574; Gamb. 153; Ridl. 100; K. & V. 3:189–193; Van Eed. 64; Pierre 358; Bargagli-Petrucci 37.

Xylocarpus granatum Koen. (*Carapa moluccensis* Lam.) Plate XXV, fig. 43. Piagao (Phil.); niri (M.).

Same distribution as the preceding.

Wood darker than that of *X. obovatus*. Used for piling, furniture, sandals, etc.

Gamb. 153; Watt Dict. 2:142; Van Eed. 63; K. & V. 3:193–196; Pierre 359.

A third species, *X. borneensis* (Becc.), is found in Borneo and the Philippines. It is very much like *X. granatum* and is used for the same purposes.

Becc. 574; Bargagli-Petrucci 38.

POLYGALACEÆ.

Xanthophyllum. White or yellow, moderately hard and moderately heavy, fine-grained woods.

Xanthophyllum vitellinum Nees. Kitelor.
Java.

Very durable wood.

K. & V. 5:294–298; Janssonius 1:238.

EUPHORBIACEÆ.

The wood of the trees of this order has no very marked general distinguishing characteristic; but still it may be said that it is noticeable for the pores being usually more scanty than in many other orders. In some genera they are characteristically arranged in short radial lines. In almost all genera the pith-rays are fine, close and uniform; in some they are very indistinct. In other genera transverse ladder-like bars are conspicuous. In respect to color, there are three classes, the white or gray, the red, and the brown or grayish-brown. In respect to weight, some are very light, most moderately so, few or none very heavy. Among white-wooded genera the most noticeable are:

(1) Soft woods: *Euphorbia, Jatropha, Givotia, Ostodes, Trewia, Sapium, Excoecaria.* Of these *Givotia* and *Trewia* show transverse bars;

Excoecaria rather numerous and *Euphorbia, Sapium* and *Jatropha* very few pores.

(2) Moderately hard woods: *Sarcococca, Daphniphyllum, Cyclostemon, Croton.* Of these *Daphniphyllum* has numerous and *Croton* very few pores, while *Croton* and *Cyclostemon* show transverse bars.

(3) Hard woods: *Hemicyclia, Lasiococca* and *Gelonium. Hemicyclia* has conspicuous, *Lasiococca* and *Gelonium* faint transverse bars.

The red-wooded genera are fairly uniform in their structure, so that *Phyllanthus, Glochidion,* and *Cleistanthus* are characterized by pores in short radial strings between regular numerous fine pith-rays. *Fluggea* has a harder close-grained wood, and *Bischofia* has rough open-grained wood with rather broad pith-rays.

In the genera with brown or grayish- or olive-brown wood, *Macaranga* is very soft, *Mallotus* pale-colored and rather soft, *Bridelia* has a hard wood of characteristic appearance, and *Putranjiva* and *Baccaurea* present transverse bars, the latter wood being lighter and softer.

The better known genera can be roughly placed in synoptical form as follows:

a. White or gray woods.
  b. Soft or very soft: *Euphorbia, Jatropha, Givotia, Ostodes, Trewia, Sapium, Excoecaria, Mallotus.*
  bb. Moderately hard: *Sarcococca, Daphniphyllum, Cyclostemon, Croton, Baccaurea, Mallotus.*
  bbb. Hard: *Hemicyclia, Lasiococca, Gelonium.*

aa. Red.
  b. Soft: *Macaranga.*
  bb. Moderately hard: *Glochidion, Bishchofia, Mischodon, Chaetocarpus, Aporosa, Macaranga.*
  bbb. Hard: *Phyllanthus, Cleistanthus, Fluggea, Antidesma, Mallotus.*

aaa. Brown or grayish-brown.
  b. Soft: *Baccaurea, Macaranga.*
  bb. Moderately hard or hard: *Mallotus, Bridelia, Putranjiva, Aporosa, Daphniphyllum, Cyclostemon.*

Although no member of the family is of very great importance as a timber tree, it may be worth while to indicate the better known species.

Aleurites moluccana (L.) Willd. Lumbang (Phil.); belgaum; "Indian walnut;" "candle-nut."

Tropical and subtropical regions of the world, the Antilles, Brazil, and widely distributed in cultivation.

Wood gray and soft. Used for tea-chests.

Lewis 310.

Antidesma bunius Spr. Bras-bras hitam (M.); boeni (Jav.).
British India, Ceylon, Java, and Malaya.

Wood red, hard, similar to that of *A. ghaesembilla.* Used for beams, rafters and the like, but not durable if exposed to the weather.

Ridl. 250; Gamb. 610; Van Eed. 219.

Antidesma ghaesembilla Gaertn. Baniyuyo (Phil.); kasumba (M.); horroe-batoe (Jav.).
Same range as preceding.

Wood red, with darker-colored heartwood, smooth, hard, close and even-grained. Seasonal rings indistinctly marked by concentric lines. Pores small and moderate-sized, uniformly distributed. Pith-rays of two sizes, few moderately broad rays with numerous fine rays between them. Interior work, not a durable wood.

Gamb. 610; Ridl. 250; Van Eed. 220.

The different species of *Antidesma* are hard, usually red, smooth, apt to split and warp and not durable.

Aporosa dioica (Roxb.) Muell. Arg.
British India and Burma.

A very hard wood with dark-brown heart and white sapwood. Used for tool handles.

Watt Dict. 1:278.

Other species of *Aporosa* furnish good wood of brown or reddish color, but the pieces are usually of small size.

Baccaurea sapida Muell. Arg.
British India, Burma, Andaman Islands.

Wood grayish-brown, soft, with transverse lines of wood parenchyma very numerous. Pores small, in short radial lines. Pith-rays moderately broad to broad, the distance between the rays being from one to three times the transverse diameter of the pores. Easily worked and fairly durable.

Gamb. 611.

The timber of other species is also good and varies in color from light yellowish-white to dark-brown.

Ridl. 251; Van Eed. 220.

Bischofia trifoliata (Roxb.) Hook. (*B. javanica* Bl.). Plate XXV, fig. 44. Toog (Phil.); gadok (Sumatra).
Tropical Asia, Malay Archipelago, Pacific Islands.

Red, coarse-grained, moderately hard wood, with strong scent of vinegar when first cut. Used for structural work and bridges. It is claimed that although it warps and cracks and is attacked by white ants when used above ground, it is almost imperishable in wet ground or under water, so that it is particularly fitted for pile foundations and railway sleepers.

Gamb. 607, *tab. XII, fig. 5;* Nörd. X; Van Eed. 221; Watt Dict. 1:454.

Bridelia retusa (L.) Spreng.
British India, Burma, and Ceylon.

Wood moderately hard to hard, gray to olive-brown, close-grained, seasons well. Seasonal rings marked by pale lines. Used for cattle-yokes, agricultural implements, carts and building; stands well under water.

Gamb. 595; Watt Dict. 1:536.
Other species are used, whenever they are of sufficient size.
Ridl. 248.

Chaetocarpus castanicarpus (Roxb.) Thw.
East Indies, Malay region.

A bright red, moderately hard, structural wood.

Gamb. 623; Watt Dict. 2:262.

Claoxylon sp.
East Indies.

Furnishes the "bois cassant."

Wiesner 2:98.

Cleistanthus collinus Benth.
British India and Ceylon.

Wood dark reddish-brown, tough, hard, close-grained, heartwood small. Produces very durable house posts.

Gamb. 597, *tab. XII, fig. 4;* Nörd. IX (*Lebedieropsis orbicularis*).

Cyclostemon griffithii Hook. f.
British India and Burma.

Wood light brown, hard. A durable timber for local use.

Gamb. 606.

Excoecaria agallocha L. Buta-buta (M.).
Tidal forests, Ceylon to the Philippines and Australia.

Soft and white wood, which is used for some kinds of furniture and toys. (See p. 431.)

Gamb. 626; Watt Dict. 3:306; Ridl. 253; Becc. 583.

Givotia rottleriformis Griff.
British India and Ceylon.

Wood white, exceedingly light, very soft but even-grained. Used for catamarans and cabinet work.

Gamb. 615; Watt Dict. 3:503.

Glochidion acuminatum Muell. Arg.
British India.

Wood red or reddish-gray, hard. Splits badly.

Gamb. 602; Nörd. X (*Phyllanthus bicolor*).
Other species of *Glochidion* are used when large enough and are fairly durable
Ridl. 249; Van Eed. 223.

Hemicyclia sepiaria W. & A.
British India and Ceylon.

Wood white with a grayish-brown heartwood, very close and even-grained, resembling boxwood. Recommended as a possible substitute for boxwood.

Gamb. 605.

Lasiococca symphylliaefolia Hook. f.
British India.

Wood yellowish-white, hard, smooth, close-grained. Recommended for trial as a substitute for boxwood.

Gamb. 622.

Mischodon zeylanicus Thw.
Ceylon.

Wood pink or pinkish-white, moderately hard, close- and even-grained. Used for building and said to be durable in water.

Gamb. 607.

Phyllanthus emblica L. Amlabaum; mirobalanenbaum.
Mascarenes, East Indies, Sunda Islands, China, Japan, also cultivated.

Wood red, hard, close-grained, warps and splits in seasoning; no heartwood. Carrying poles, agricultural implements, building and furniture; durable under water.

Gamb. 599, *tab. XIII, fig. 3;* Nörd. X; Watt Dict. 6¹:221; Van Eed. 227.

Several other species of *Phyllanthus* furnish small amounts of wood resembling the preceding.

Putranjiva roxburghii Wall.
British India, Burma, and Ceylon.

Wood gray, moderately hard, close-grained. A structural wood, also used in turning.

Gamb. 604; Nörd. X; Van Eed. 228; Watt Dict. 6¹:372.

Sapium sebiferum Roxb.
China, Japan, East Indies, cultivated in the tropics everywhere.

Wood white, moderately hard. Furniture and toys.

Gamb. 625; Nörd. VIII; Watt Dict. 6²:472.

Trewia nudiflora L.
British India, Burma and Ceylon, to the Sunda Islands.

Wood white, soft, not durable. Used for native drums and agricultural implements.

Gamb. 617; Watt Dict. 4:76; Van Eed. 228.

BUXACEÆ.

The most uniform in grain of any known wood, planing almost equally well in any direction. Very hard and very heavy (sp. gr. 0.99–0.86). The best qualities of boxwood are the best known for wood engraving, drawing instruments, etc. The sawdust is very free from gritty matter, and on that account it is much used for cleaning jewelry. Numerous

attempts have been made to find a suitable substitute for this wood, but, thus far, unsuccessfully. (See article on boxwood substitutes, p. 426.)

Buxus sempervirens L. Boxwood.
India and western Asia to the Mediterranean region.
Stone 102; Wiesner 2:962; Gamb. 592–594; Nörd. II, also Mech. Eigensch. Hölzer 514.

ANACARDIACEÆ.

The woods of this family are very variable as to color, weight, and hardness. *Pistacia,* some species of *Rhus, Gluta, Melanorrhoea, Odina,* and *Drimycarpus* have hard woods, red or yellow; those of *Semecarpus, Mangifera, Spondias, Holigarna,* and *Buchanania* are more or less soft, and light-gray or brown. In some, the pith-rays are numerous, in others scanty, but the chief general character is that of large pores which are scanty and prominent on vertical section, and pith-rays soft, dark and inconspicuous. Concentric lines occur in some species.

Anacardium occidentale L. "Cashew nut;" "acajoubaum;" "acajou a fruits;" "acajou a pommes;" "acajou de Guadeloupe."
South America; cultivated in all tropical regions.

Red, moderately hard wood. Boats and tea-chests.

Watt Dict. 1:223; Ridl. 108; Gamb. 214.

Bouea burmanica Griff. Rauminiya.
Burma and Malaya.

Light-colored sapwood, dark-reddish heartwood, sometimes dark-brown; rings distinct, pores small, few, scattered; concentric lines numerous, wavy, distinct. Durable and very heavy; posts and beams.

Ridl. 107; Gamb. 214; Pierre 366.

Bouea macrophylla Griff. Kadongan.
Malaya.

Wood yellowish-white, becoming brown toward its center. Moderately hard; does not split in drying. Kris scabbards.

Ridl. 107.

Buchanania florida var. **arborescens** Engl. Balinhasay (Phil.).
Philippines and the Malay Archipelago.

Moderately hard and moderately heavy, pale-reddish; rather fine but not straight-grained. Light or temporary construction; not durable. Often substituted for the wood of *Koordersiodendron,* to which it is much inferior.

Phil. Woods 374; Pierre 371.

Buchanania latifolia Roxb.
India, Burma, Malacca.

Brownish-gray, moderately hard, not durable. Used for boxes, tables, etc.

Watt Dict. 1:545; Gamb. 216.

Other species of *Buchanania* are used, but none of them furnish very high grade wood.

Campnosperma zeylanicum Thw.
Ceylon.

A light and rather inferior wood, used for tea-chests.

Lewis 309.

Campnosperma wallichii King. Terungtang.
Malay Peninsula.

Wood soft, rather light silvery-gray or white, fine-grained. Pores rather large and numerous. Pith-rays fine and brown, obscure. Suitable for some grades of cabinet work.

Ridl. 111.

Dracontomelum mangiferum Bl. Daoe, dahoe (Sumatra); raoe (Java).
Borneo, Celebes, Sumatra, Java, Burma, Malay Peninsula, Andaman Islands.

Wood dark-gray, moderately hard and moderately heavy; fairly durable.

Gard. 69; Van Eed. 85; K. & V. 4:114–117; Pierre 374.

Dracontomelum cumingianum Baill., known as *lamio*, and *Dracontomelum dao* Merr. & Rolfe, of the Philippines, have wood which is practically indistinguishable from that of *D. mangiferum*.

Drimycarpus racemosus Hook. f.
Eastern Himalaya.

Wood yellowish-gray, hard. Much prized for shipbuilding in India (Chittagong).

Gamb. 221; Watt Dict. 3:195.

Gluta. Wood dark-red and more or less streaked with orange and black. Pores few, often filled with resin, large, prominent on vertical sections. Pith-rays very fine. Interrupted, very narrow, undulating, concentric bands. Structure of the wood in this genus much the same as in *Melanorrhoea* and *Swintonia*.

Gluta renghas L. Renghas (M.).
Malay Archipelago and Peninsula.

Wood with decidedly irritant properties. House building, boats, furniture, sheaths of weapons.

Van Eed. 86; Ridl. 110; K. & V. 4:94–97; Wiesner 2:1017.

Gluta tavoyana Wall. and *G. travancorica* Bedd. of British India and Burma and *G. velutina* Bl. (*G. coarctata* Hook.) of Malacca, Banka and Sumatra are all said to furnish wood much like that of *G. renghas* and used for structural work and furniture. *G. velutina* is said to be resistant to termites and to sea water.

Pierre 368.

Holigarna. Wood soft, grayish. Pores large, prominent on vertical section. Pith-rays very fine, short.

Holigarna arnottiana Hook. f.
British India.

Wood containing a poisonous gum. Used for house and boat building.

Gamb. 221.

Koordersiodendron pinnatum (Blanco) Merr. (*Helicteres pinnata* Blanco). Plate XXV, fig. 45. Amuguis (Phil.).

Philippines, Celebes, and New Guinea.

Wood moderately hard, and heavy, fine-grained, dark-red. Much in demand for construction and cabinet work.

Phil. Woods 371; Gard. 62.

Lannea grandis (Dennst.) Engl. (*Calesiam grandis* O. Ktze; *Odina wodier* Roxb.). Kiamil (Hind.); wodier (Tam.); nabhay (Burm.); hik (Cingh.).

India, Ceylon, Burma.

A generally useful wood, which is not to be distinguished from that of *Koordersiodendron.*

Watt Dict. 5:445; Ridl. 108; Van Eed. 88; Gamb. 218–220, *tab. V, fig. 6;* Nörd. IX; Pierre 375.

Mangifera. No heartwood, grayish to brownish in color. Pores large, prominent on a vertical section. Pith-rays fine, generally closely packed. Occasionally fine, wavy, concentric lines.

Mangifera indica L. The mango.

British India, Burma, Ceylon and Malaya; widely cultivated.

Planking, doors and window frames, packing cases, canoes. Other species of *Mangifera* are used in much the same way.

Gamb. 111–114; Nörd. V; Ridl. 108; Watt Dict. 5:146–157; Van Eed. 87; K. & V. 4:75–93; Lewis 309; Pierre 361.

Melanochyla spp.

Various fairly good woods of the Malay Peninsula and Borneo, which are usually of rather small size and not in great quantity.

Becc. 575; Ridl. 110; Bargagli-Petrucci 40.

Melanorrhoea. (Plate XXV, fig. 46.) Wood dark-red, with yellowish streaks, turning very dark after long exposure, very hard and heavy. Pores moderate-sized, scanty, often subdivided, each pore or group of pores inclosed in a small patch of light tissue. Pith-rays very fine, wavy, very numerous. Numerous undulating, often interrupted, very narrow, concentric lines of soft tissue, unequally distributed in the wood. Contains a poisonous gum, which may even affect a person after the wood is made up into furniture.

Melanorrhoea maingayi Hook. f. Rengas manau (M.); "Straits mahogany."

Malay Peninsula, Sumatra, and Borneo.

Beams and furniture.

Ridl. 109.

Melanorrhoea usitata Wall. "Black varnish tree," thitsi (Burm.).

British India.

Tool handles, anchor stocks, building, railway sleepers, gunstocks.

Gamb. 217, *tab. V, fig. 5;* Nörd. VIII; Watt Dict. 5:210; Pierre 367.

Several other species occur in the Malay region and are known by the name of *ringas* (Becc. 575), or "Borneo rosewood." Their uses are

like those given above. Their poisonous properties have occasioned so much inconvenience that the wood is gradually going out of use. Where this wood is used, it is customary to fell it and then to leave it in the jungle until the beetles, termites, etc., have completely destroyed the sapwood.

Pistacia integerrima J. L. Stewart.
British India.

Wood very hard; sapwood white; heartwood yellowish-brown, beautifully mottled with yellow and dark veins. Seasonal rings marked by a belt of large pores. Pores in the rest of the wood very small, forming irregular patches, which are frequently arranged in zigzag lines. Pith-rays fine, very numerous. Used for furniture, carvings and all kinds of ornamental work.

Gamb. 210, *tab. V, fig. 4;* Nörd. X.

Rhus. Wood gray, often streaked, with a yellow or brown heartwood. Pores small, but often large and in continuous porous belts in the earlier-formed wood. Pith-rays fine and moderately broad.

Several species occur scattered in the highlands through this range; but they are of little importance commercially because of their small size and scattered occurrence.

Semecarpus. Wood usually of poor quality. Used locally for light or temporary construction. The wood has poisonous properties, like *Melanorrhoea, Swintonia, Gluta,* etc., which interfere with its usefulness.

(See p. 431.)
Gamb. 220; K. & V. 4:122–230; Van Eed. 90; Lewis 309.

Swintonia. Wood much like that of *Melanorrhoea,* but not so prominently streaked. Usually a more even, reddish or whitish color. Equally poisonous. Large trees in the Malay Peninsula, but reaching their best development in Borneo.

AQUIFOLIACEÆ.

Ilex spp. Numerous species of this genus occur throughout the orient, but they are usually of small size and not of any very general usefulness. Wood fine-grained, white, hard.

CELASTRACEÆ.

Wood compact, even-grained, white. Pores very or extremely small. Pith-rays very fine and very numerous.

Euonymus hamiltoniana Wall.
Northern India, central Asia, Japan.

The yellowish-white, soft wood is used in India for wood carving.
Watt Dict. 3:292.

Euonymus crenulata Wall.
Southern India.

The white, very hard wood is considered in its native country the best substitute for box.

Watt Dict. 3:291.

Kurrimia robusta Kurz.
Cochin China.

The wood, with a structure similar to that of *Dalbergia* spp., produces excellent material for cabinet work.

Kokoona zeylanica Thw.
Ceylon.

Wood for tea chests.

Lewis 309.

Cassine glauca (Pers.) O. Ktze.
Tropical Asia.

Clear-brown to reddish, often beautifully marked, moderately hard, readily polished wood for framing and cabinet work.

Watt Dict. 3:207.

Lophopetalum. Wood light, soft to moderately hard, even-grained, somewhat shining. Pores small to moderate-sized. Pith-rays very fine, very numerous. Concentric very narrow dark lines of wood parenchyma, prominent, interrupted, wavy.

Lophopetalum wightianum Arn.
British India, Cochin China.

Reddish-gray, moderately hard, close-grained. Pores large, usually subdivided, sometimes in short strings. Pith-rays fine, conspicuously bent around the pores when they meet them. Parallel narrow concentric lines prominent. House building.

Gamb. 174; Nörd. X; Pierre 307.

Gymnosporia. Wood close- and even-grained. Pores small or very small. Pith-rays fine and very numerous. Concentric bands prominent in most species, caused by variations in the size of the wood cells, some of the cells being filled with a dark resin-like substance.

Gymnosporia montana Lawson (*Celastrus senegalensis* Lam.).
British India.

Light-reddish-brown, soft, close-grained, durable.

Gamb. 177; Nörd. XI.

ICACINACEÆ.

Gonocaryum sp. Swamp trees of the forests of Burma.

Urandra apicalis Thw.
Ceylon.

Wood used for tea-chests.

Lewis 309.

Urandra sp. Plate XXV, fig. 47. Bedaru, pedaro (Sarawak); daru, daroo-daroo (M.).

Sarawak.

Wood hard and heavy, fine- and straight-grained. Sapwood narrow, yellowish; heartwood somewhat darker. Pores moderate-sized, narrowly fringed and containing glistening deposits. Pith-rays medium-sized, whitish, very distinct, giving fine grain in quartered material. This wood is very durable, works readily and is used for canes, furniture and piling. It has a very distinct and pleasing odor. This wood is to be found in some quantity in the markets at Singapore and is said to come from Sumatra as well as Borneo. Newton credited it to *Apodytes*, another genus of this family, and later it was considered one of the *Sapotaceae*. (See p. 542.) I collected herbarium material and wood samples from a tree of this in Sarawak and later obtained material of the same wood from dealers in Singapore. My flowering material was not mature and I could not be sure of the genus until I received good flowering material from Mr. J. C. Moulton, curator of the museum at Kuching. This material establishes the fact that the plant belongs to the genus *Urandra* and probably to an undescribed species.

Newton 2; Ridl. 214; Becc. 584.

ACERACEÆ.

Wood moderately hard and close-grained; no heartwood; white or yellowish. Pores small and very small, uniformly distributed. Pith-rays fine and very fine, often of two sizes. Concentric medullary patches frequent. Usually in the high mountains. Not of commercial importance in this region.

SAPINDACEÆ.

Wood generally soft or moderately hard, occasionally very hard, even-grained. Pores small or very small, generally uniform and uniformly distributed. Pith-rays very fine or fine, rarely moderately broad, often closely packed. Concentric bands occur in *Sapindus* and some other genera but not in all.

Aphania montana Bl.

Java.

Used in house building, etc.

K. & V. 9:158–160.

Aphania paucijuga Radlk. Pukan jantan; mumpilai klat; tulang putih (M.).

Malay Peninsula.

Wood hard and heavy, flexible. Used in house building, for posts, etc.

Ridl. 106.

Arytera littoralis Bl. Kulu layo hitam (M.).
Malay Peninsula and Archipelago to the Philippines.

Wood pale, reddish-white, moderately heavy and hard, rings fairly distinct and remote; pores numerous; small rays obscure. Used in house building.

Ridl. 106; K. & V. **9**:216–220.

Dittelasma rarak Hook. f. (*Sapindus rarak* DC.) Lerek (Jav.).
Malacca, Cochin China, Philippines.

Hard and heavy, durable. Used for house building.

Van Eed. 77; K. & V. **9**:150–152.

Dodonaea viscosa L. Plate XXV, fig. 48. Banderu.
In all tropical lands.

Sapwood white; heartwood dark brown, extremely hard and very heavy, called "lignum-vitæ" in Australia. Used for turnery, wood carving, walking sticks.

Ridl. 106; Gamb. 202; K. & V. **9**:227–230; Van Eed. 78.

Ellatostachys verrucosa Radlk.
Java, Timor, Celebes, Philippines.

Moderately hard and moderately heavy.

K. & V. **9**:212–215.

Erioglossum rubiginosum Bl. (*E. edule* Bl.). Mertajam; kelat layu (M.).
Malay Peninsula and Archipelago to Australia.

Wood reddish-white to chocolate-brown, grain fine, hard, does not split in drying.

E.-Pr. 3^5:300; Ridl. 104; Van Eed. 78; Gamb. 192; K. & V. **9**:154–157.

Euphoria cinerea Radlk. Plate XXVI, fig. 49.
Philippines.

Dark-red, hard and heavy, durable. A very choice structural wood, much like some of the wood of species of *Nephelium*.

Phil. Woods 371.

Ganophyllum falcatum Bl.
Philippines, Java, New Guinea, Australia.

Excellent wood for matches and match boxes.

Van Eed. 78; K. & V. **9**:231–234.

Guioa pubescens Radlk. Sugi-sugi; Nilan (M.).
Malay Peninsula.

Wood heavy and hard, light-brown, pores small, not numerous, rays fairly fine, concentric lines rather distant and broad, undulating. Brittle, used in building.

Ridl. 106; K. & V. **9**:210.

Harpullia cupanioides Roxb. Kajoe-kaleh (M.).
Burma, Andaman Islands, Malacca, Sumatra, Java, Borneo, New Guinea.

Wood white, soft. Pores moderate-sized, scanty, in whitish patches. Pith-rays fine, numerous.

Gamb. 199; Van Eed. 78; K. & V. **9**:239–242.

Harpullia imbricata Thw.
Java.
K. & V. **9**:236–239.

Litchi chinensis Sonn. (*Nephelium litchi* Cambess.) Litchi.
China, India; widely cultivated.

Wood nearly indestructible; used in carriage building and for cabinet work.

Wiesner **2**:104; Gamb. 198; Nörd. V (*Euphorbia litchi*); Van Eed. 79.

Litchi philippinensis Radlk.
Philippines.

A rather rare wood much like the last.

Nephelium. Wood red, hard; prominent wavy concentric bands.

Nephelium lappaceum L. Rambutan (M.).
Malay Peninsula and Archipelago.

Wood hard and heavy, red when fresh cut, becoming dirty-reddish-white or whitish-brown; pores large, scattered, surrounded by patches of lighter-colored softer tissue; pith-rays very fine and obscure, concentric rings broken up into short wavy pieces. Apt to split in drying, but considered good for planks, beams, and other hard work, for water wheels, rice mills, stampers, etc.

Van Eed. 79; Ridl. 104; K. & V. **9**:186–188; Pierre 319.

Nephelium longana Cambess. (*Euphoria longana* Lam.). Longan.
British India, Ceylon, Malay Peninsula and Archipelago.

A very hard and heavy red wood, much used for structural work and furniture.

Watt Dict. **5**:348; Gamb. 197; Nörd. IX (*Euphoria longana*); Van Eed. 80; Pierre 318.

Nephelium mutabile Bl. Pulasan (M.).
Malay Peninsula, Sumatra, Java, Philippines.

Wood harder and heavier than that of *N. lappaceum*.

Ridl. 105; Van Eed. 80; K. & V. **9**:192.

Other species of *Nephelium* are also used. The wood of *Euphoria, Nephelium, Litchi,* and possibly some other genera, is so closely related that I can not distinguish it by the structure.

Pometia pinnata Forst. Plate XXVI, fig. 50. Dawa; lengsar; malugay (Phil.).

New Guinea, Sunda and South Sea Islands, Philippines, Ceylon, Andamans.

A moderately hard and moderately heavy wood, reddish. Used in structural work.

Phil. Woods 388; Gard. 66; Van Eed. 80; K. & V. **9**:196.

Sapindus trifoliatus L. "Soap-nut tree;" ritha.

Southern Asia.

A yellow, hard, structural wood.

Watt Dict. **6**²:471.

Schleichera trijuga W. "Lac tree;" "Ceylon oak;" kosum (Hind.).

Tropical Asia.

Hard, durable, readily polished wood, with white sapwood and red-brown heartwood. Used for oil and sugar mills, rice-pounders (the best wood for the purpose in southern India), agricultural implements and carts; firewood and charcoal.

Gamb. 194, *tab. IV, fig. 6;* Nörd. VII (*Melicocca trijuga* Juss.); Watt Dict. **6**²:488; Van Eed. 81; K. & V. **9**:177–180.

Xerospermum muricatum Bl. Rambutan pachat.

Malay Peninsula.

Wood brown, light, durable and good; used for building.

Ridl. 105.

Xerospermum noronhianum Bl. Ramboetan-oetan.

Sumatra and Java.

Wood much like the preceding.

Van Eed. 82; K. & V. **9**:182–184.

STAPHYLEACEÆ.

Turpinia pomifera DC. Geritta.

Malay Peninsula and Archipelago, British India, Ceylon, and China.

Light and soft, not a durable wood. Used for household utensils.

Van Eed. 81; Ridl. 106.

SABIACEÆ.

Meliosma dilleniaefolia Bl.

Himalaya.

White, moderately hard, even-grained. Seasonal rings marked by a continuous line of pores and darker color. Pores small, single or sub-divided or in rounded groups, except along the seasonal rings. Pith-rays wavy, moderately broad or fine, distinctly marked in silver grain, which has a satiny luster.

Gamb. 205, *tab. V, fig. 3;* Nörd. VIII.

Several other species occur with wood as described, but they are usually scattered and of small size.

RHAMNACEÆ.

Hovena dulcis Thunb. Kemponashi.
China, Japan, Himalaya.

Furniture and musical instruments.

Gamb. 187; Nörd. VII.

Zizyphus. Wood reddish, moderately hard or hard; no heartwood. Pores small to moderate-sized, often subdivided and fringed with wood parenchyma between numerous fine or very fine pith-rays.

Zizyphus jujuba Lam. "Indian jujube;" "Chinese date."
China, India, Australia, tropical Africa; much cultivated.

Durable structural and furniture wood.

Gamb. 181, *tab. IV, fig. 3;* Nörd. IX; Watt Dict. 6[4]:370; Van Eed. 75.

Zizyphus vulgaris Lam. "Acajou d'Afrique."
Orient to Bengal, China, and Japan; cultivated in southern Europe.

Similar to the preceding; cabinet work.

Gamb. 182; Nörd. II; Watt Dict. 6[4]:373.

Zizyphus xylopyrus Willd.
India and Ceylon.

Carriage building, agricultural implements, charcoal.

Gamb. 183; Watt Dict. 6[4]:374.

Zizyphus zonulatus Blanco (*Z. arborea* Merr.). Plate XXVI, fig. 51. Balacat.
Philippines.

Wood very pale-reddish or whitish; sapwood quickly eaten by beetles; heartwood very durable.

Phil. Woods 374; Gard. 60.

ELAEOCARPACEÆ.

Elaeocarpus lancaefolius Roxb.
Tropical Asia.

Bright-brown, soft wood, for tea chests.

Watt Dict. 3:206.

Muntingia calabura L. "Calabure;" "bois ramier;" "bois de soie."
Mexico to the Amazon River; widely cultivated.

Wood very soft and light, not durable.

Wiesner 2:107.

Echinocarpus dasycarpus Benth.
British India.

Wood grayish-brown, soft. Used for planks and beams where not exposed to changes of weather.

Gamb. 113; Nörd. X.

GONYSTYLACEÆ.

(Plate XXVI, fig. 52.)

Wood hard and heavy, sometimes with a distinct odor when cut. Sapwood white or yellowish; heartwood dark-brownish-yellow to almost black. Seasonal rings not present. Pores small or medium-sized, scattered, often with apparently crystalline contents. Pith-rays small, numerous, bending out around the vessels. Wood parenchyma present in irregular, broken, concentric lines.

Gonystylus bancanus (Miq.) Gilg (*G. miquelianus* T. & B.). Kayu garu (M.).

Java, Sumatra, Banca, Philippines.

The dark heartwood seems not to be of constant occurrence. Wherever the dark heart does occur, it is said to furnish a useful incense wood and to be useful for small chests. The other species of the genus are credited with having the same qualities. Other species of the genus are found in the Malay Peninsula, in Sumatra, Borneo and other portions of the Malay region.

E. Gilg in Engl. & Prantl Nachtr. 232; Teysm. & Binn. in Bot. Zeit. (1862) 265; K. & V. **9**:48–51; Boorsma in Bull. Dept. Agr. Ned. Ind. **7** (1907) 6–13; Bargagli-Petrucci 45, *tab. IX;* Becc. 582.

(See p. 428.)

TILIACEÆ.

Berrya ammonilla Roxb. Plate XXVI, fig. 53. Halmalille; trincomali.

British India, Ceylon, Malay Archipelago.

Smooth yellow wood with dark-red heart. Heavy, very hard and durable. Distinct parallel transverse lines in longitudinal section. On account of its toughness and elasticity, much prized for house and boat building, agricultural implements, etc. A possible substitute for satinwood.

Watt Dict. **1**:448; Semler 674; Gamb. 107; K. & V. **5**:406–409; Van Eed. 46; Bargagli-Petrucci 46, *tab. IX;* Stone 16–18; Becc. 573; Janssonius **1**:491.

Brownlowia elata Roxb.

India and Borneo.

Soft, reddish-gray. Fine irregular bars between pith-rays, not joining into concentric rings.

Gamb. 106.

Brownlowia tabularis Pierre.

Cochin China.

"One of the best redwoods known." Structural work, shipbuilding, furniture.

Pierre 132.

Grewia tiliaefolia Vahl.
British India and Ceylon, tropical Africa.

White wood, with small brown heart. Hard, easy to work, very durable. Used wherever firmness and elasticity must be combined, as in masts, rudders, etc.

Watt Dict. 4:184; Gamb. 109.

Grewia microcos L.
British India, Burma, Ceylon, Cochin China.

Gray, soft. Pores moderate-sized, scanty, joined by wavy belts of soft tissue, broken but concentrically arranged.

Gamb. 112; Nörd. IV; Pierre 152; K. & V. 1:226–228; Janssonius 1:502.

Numerous other species of *Grewia* occur and some of them are also used like those above described.

Pentace burmanica (L.) Kurz.
British India, Malacca, Java.

White, on exposure to the air reddish, light, soft wood, used principally for boats and tea-chests.

Watt Dict. 4[1]:131; E.-Pr. 3[6]:17; Gamb. 106; Pierre 151.

Schoutenia ovata Korth. Oostindisch paarden vleesch (Dutch).
Java.

Beautiful reddish-brown, long- and smooth-fibered, very elastic and durable structural wood, surpassing all others for bows.

Van Eed. 51; K. & V. 1:211–215; Janssonius 1:525.

MALVACEÆ.

Wood soft to moderately hard; light to heavy. Pores of medium size, scattered. Pith-rays of medium size. Sapwood and heartwood usually quite distinct. Heartwood often with distinct rose-like odor.

Bombycidendron campylosiphon (Turcz.) Warb. Plate XXVI, figs. 54, 55.
Probably not to be distinguished in the wood from *B. vidalianum* (Naves) Merr. & Rolfe.
Philippines.

Wood with much the same appearance as that of *Hibiscus tiliaceus* but distinctly harder and heavier; and with distinct ripple marks on the tangential surface (Plate XXVI, fig. 55). Used for cabinet making, carriage building, shafts, flooring, ordinary construction, furniture, planks, boat building, telegraph poles, sides and backs of guitars and mandolins.

Phil. Woods 385.

Hibiscus tiliaceus L. "Corkwood" of the Antilles.
Tropics of the world.

The nut-brown, very light and easily worked wood is used as floats for fish nets, light boats, etc. Also for some purposes as a kind of "rosewood."

K. & V. 2:106; Watt Dict. 4:247; Gamb. 88; Nörd. IX; Van Eed. 36; Ridl. 49; Janssonius 1:380.

Several other species of *Hibiscus* which closely resemble this are used in the same fashion.

Kydia calycina Roxb.
Himalaya, western Ghats, Burma.

The white, very tough and elastic wood without heartwood is used for house building, rudders, and turnery.

Watt Dict. 4:569; Gamb. 89.

Thespesia populnea (L.) Corr. Plate XXVI, fig. 56. "Tulip tree;" "faux bois de rose;" "bois de rose de l'Oceanie;" "Portia tree;" "umbrella tree;" baru laut (M.); banalo (Phil.).

Tropical Africa, Asia, Malaya, and Polynesia, to Australia; introduced and escaped in the West Indies.

Soft sapwood, light red; hard, dark-red heartwood. Moderately heavy and durable. Smells like roses when rubbed. Carriage building, furniture, and cabinet work. (See p. 432.)

K. & V. 2:118; Watt Dict. 6[4]:47; Ridl. 49; Gamb. 88; Pierre 173; Van Eed. 37; Stone 10.

BOMBACACEÆ.

Bombax. Wood usually white, soft and light. Pores large, scanty. Pith-rays broad.

Bombax malabaricum DC. "Cork wood;" "fromage de Hollande."
British India to North Australia.

Durable under water; used for floats for fishing nets, boats, boxes and tea-chests. (See p. 427.)

Gamb. 90; Nörd. XI; Watt Dict. 1:491; Wiesner 2:1022; K. & V. 2:122–125; Van Eed. 33; Lewis 308; Janssonius 1:398.

Boschia griffithii Mast. Daun durian; dendurien (M.).
Malacca.

Brown, darker-marked, very useful wood.

Ridl. 49.

Ceiba pentandra (L.) Gaertn. (*Eriodendron anfractuosum* DC.). "Silk cotton tree."
Mexico, Antilles, Africa, India, Malaya.

Soft, white, weak wood. Used for chests, boats, etc.

Ridl. 48; Gamb. 91; Wiesner 2:1022; Janssonius 1:399; Van Eed. 34.

Coelostegia griffithii Benth. Pungai (M.).
Malacca.

Wood orange when freshly cut, becoming darker and of a reddish color. Hard, flexible, and durable. Used in house building.

Ridl. 49.

Cumingia philippinensis Vid.
Philippines.

Wood soft and light, white and coarse-grained. Used for planks and temporary construction.

Cullenia excelsa Wight.
British India, Andaman Islands, Ceylon.

Tea-chests.

Gamb. 92; Lewis 308.

Durio zibethinus DC. Durian.
Southern and eastern Asia, Malay Archipelago.

Wood pale-reddish-brown, soft. Pores large, scanty, often subdivided. Pith-rays moderately broad, numerous, giving a well-marked silver grain. Temporary construction work.

K. & V. 2:132–134; Gamb. 92; Becc. 572; Van Eed. 34; Ridl. 48; Janssonius 1:404; Bargagli-Petrucci 49, *tab. X.*

Several other species of this genus in Borneo and Sumatra are also used to some extent.

Neesia altissima Bl.
Java.

Brown, beautifully marked, very soft wood, used for small cabinet work. Termite-proof.

K. & V. 2:129–131; Van Eed. 37; Janssonius 1:408.

STERCULIACEÆ.

Wood very soft to very hard; very light to very heavy. Pores rather scanty, often large. Pith-rays rather numerous, usually of medium size. Concentric bands of wood parenchyma in some species.

Eriolaena candollei Wall.
Western India.

Brick-red, orange-yellow and brown striped; moderately hard, shining. Cart building, gunstocks, paddles, etc.

Gamb. 103; Nörd. IX; Watt Dict. 3:265.
Other species are used locally in India and Cochin China.

Heritiera. Wood very heavy and very hard; dark-reddish-brown heart- and white sapwood. Pith-rays of medium size. Wood parenchyma in very fine, irregular, concentric lines.

Heritiera littoralis Dry. Totonai; dungon-late (Phil.); dungon (M.); sundri (Beng.).
East Africa, Indo-Malayan region, Australia; a very widely distributed species.

Boat building, posts, piles, house building, palisades, etc.

Watt Dict. 4:224; Gamb. 98; Phil. Woods 383; Ridl. 51; Van Eed. 39; K. & V. 2:170–174; Pierre 203; Janssonius 449; Bargagli-Petrucci 52, *tab. XI;* Becc. 573.

Heritiera minor Lam. (*H. fomes* Ham.). "Plank tree" (on account of the plank-like prop roots); sundri (Beng.).
Ganges Delta, southern India, Burma, Borneo.

Brown durable wood, considered to be the toughest in India. Boat, house, and bridge building; also used as firewood, and furnishes the best charcoal for gunpowder.

E.-Pr. 3^6:99; Watt Dict. 4:223; Gamb. 97; Nörd. XI.

Kleinhofia hospita L.
India, East Africa, through Malaya to New Guinea and Polynesia.

Whitish, brown-spotted wood, valued for walking sticks, weapon handles, etc.

Pierre 177; Gamb. 99; Van Eed. 39; K. & V. 2:178–181; Janssonius 461.

Pterocymbium javanicum Bl.
Java.

Wood very much the same as that of *P. tinctorium*.

Janssonius 439; K. & V. 2:162–165.

Pterocymbium tinctorium (Blanco) Merr. Plate XXVI, fig. 57. Teluto.
Philippines.

Wood very soft and light, whitish, no heartwood. Pith-rays large. Pores large and scattered; ripple marks very evident on tangential section.

Phil. Woods 395.

Pterocymbium viridiflorum T. & B. Taloetoe.
Celebes.

Like the preceding.

Van Eed. 41.

Pterospermum. Wood reddish, moderately hard. Pores small and moderate-sized, often in short radial lines. Pith-rays fine, closely packed.

Pterospermum suberifolium Lam.
British India and Ceylon.

Structural wood.

Gamb. 101; Nörd. X (pith-rays very short, arranged on the transverse section in watermark pattern); Watt Dict. 4:184; Van Eed. 42; K. & V. 2:186–191.
Several other species of the genus are also used.

Sterculia. Wood usually light and soft, not durable. Pith-rays of medium size. Pores of medium size, scattered.

Sterculia foetida L. Telambu (Cingh.).
British India to New South Wales; cultivated in America.

Gray soft wood, for masts and boxes.

Watt Dict. 6^3:363; Gamb. 93; Van Eed. 43; Janssonius 422; K. & V. 2: 139–142.
A number of other species are used, but none are of much importance.

Tarrietia. Wood with dark red or reddish-brown heart. Moderately hard to very hard and heavy. Pores medium-size to large, often with colored deposits. Pith-rays moderately large. Wood parenchyma scattered, occasionally in irregular, broken, concentric lines.

Tarrietia cochinchinensis Pierre.
Cochin China.

A useful structural wood in Cochin China.

Pierre 205.

Tarrietia javanica Bl. Plate XXVI, fig. 58. Lumbayao (Phil.).
Java, Cochin China, Philippines.

Light- or dark-red; light and easy to work. Good furniture wood.

Phil. Woods 387; Gard. 68; This Journ. 3 (1908) Bot. 171; Van Eed. 44; K. & V. 2:166–168.

Tarrietia simplicifolia Mast. Teraling; merbaju; siku keluang (M.).
Malay Peninsula.

Wood very pale-red, becoming darker toward the center; grain medium; fairly hard, splits in drying. Largely used in cart wheels.

Ridl. 50.

Tarrietia sylvatica (Vid.) Merr. Plate XXVI, fig. 59. Dungon.
Philippines.

Wood very hard and heavy. Dark-reddish-brown. Very durable; much valued for piling.

Phil. Woods 382; Gard. 59.

DILLENIACEÆ.

Dillenia. Wood light-red or reddish-brown, moderately hard. Pores medium-sized, uniformly distributed, often filled with a white substance. Pith-rays of two classes, numerous, broad or moderately broad with a few very fine ones between them.

Dillenia aurea Smith.
Upper India, Malay Archipelago.

Gray to reddish, beautifully marked, hard, difficult to work. Construction.

Watt Dict. 3:112; Gamb. 5; Nörd. V; Ridl. 5; K. & V. 1:165–167; Pierre 11–13; Janssonius 76.

Dillenia indica L. (*D. speciosa* Thunb.). Simpor (M.).
India, Burma, Ceylon, the Malay Peninsula and Archipelago; much cultivated.

Red, bright-spotted, moderately hard wood. Structural purposes.

Watt Dict. 3:113; Gamb. 4, *tab. I, fig. 1;* Nörd. XI and IX (*D. speciosa*); Ridl. 5; Van Eed. 1; K. & V. 1:161; Janssonius 71.

Dillenia philippinensis Rolfe. Plate XXVI, fig. 60. Catmon.
Philippines.

Hard and heavy; excellent furniture wood.

Phil. Woods 381.

Several other species of *Dillenia* are used. They seem to show the qualities of those already mentioned.

OCHNACEÆ.

Wood reddish-brown, even-grained. Pores small, uniformly distributed. Pith-rays not prominent, moderately broad, short, giving a pretty silver grain.

Ochna squarrosa L.
British India and Burma.

Wood suitable for inlaying and carving.

Gamb. 136.

THEACEÆ.

Eurya acuminata DC. Malukut jantan.
India to Malaya.

Wood pale-red, grain fine, splits slightly in drying. Used for beams in house building; also for charcoal.

Ridl. 48; Janssonius 302.

Eurya japonica Thunb. Hisakaki.
India to China, Japan, and Malaya.

Carriage building and turnery.

Pierre 126; Janssonius 306.

Gordonia excelsa Bl. Pagar anak jantan.

British India and Malaya.

Wood pale-red, heavy and hard. Used for houses, beams, and posts.

Ridl. 48; Janssonius 334.

Gordonia obtusa Wall.
British India.

Wood pinkish-white to reddish-brown. Pores small, very numerous, uniformly arranged between the fine, short, very numerous pith-rays, the distance between which is equal to the transverse diameter of the pores. Seasonal rings faintly marked by a line. Construction work.

Gamb. 67.

Schima noronhae Reinw. (*S. crenata* Korth.). Medang bekwoi.
British India, Malay Peninsula, Sumatra, Borneo, Philippines.

Timber very close-grained, dark-red; rays very fine and obscure, not close, pores exceedingly numerous, very small, containing a resinous substance. The wood is heavy and hard, shining, apt to split but useful. Used for house posts and rice mortars.

Ridl. 47; Watt Dict. 6^2:485; Pierre 121; Janssonius 327.

Schima wallichii Choisy.
Himalaya, Tenasserim, Farther India.

Red, moderately hard in drying, durable. Construction work.

Gamb. 66, *tab. I, fig. 5;* Nörd. X; Watt Dict. 6^2:486.

Ternstroemia japonica Thunb. Makakoku.
Ceylon, India, China, Japan, Sumatra

Red, hard wood, sometimes used for furniture.

Janssonius 296.

GUTTIFERÆ.

Wood usually reddish, generally with a distinct heartwood, and marked by characteristic, faint, concentric lines, which are often interrupted. Pores variable in size, usually rather large, single or more or less oblique wavy lines. Pith-rays fine or very fine, clearly marked.

Calophyllum. Wood soft or moderately hard, reddish, with a darker-colored heartwood; seasons well; weight moderate. Cellular tissue regular, cells roughly rectangular. Pores medium-sized or large, prominent on a vertical section, arranged in wavy strings or groups. Pith-rays fine or very fine, indistinct on a cross-section, but prominent as straight narrow lines on a radial section. Interrupted concentric lines of darker color and larger cells, also prominent on vertical section.

Calophyllum inophyllum L. Plate XXVII, fig. 61. "Alexandrian laurel;" palo maria de la playa or bitaog (Phil.); pennagah (M.).

Africa to India, Malaya, Australia, and Polynesia; often cultivated.

Extremely difficult to split. Used for fine furniture, bowling balls, knees of boats, turnery, etc. (See p. 431.)

Gamb. 67, *tab. I, fig. 4;* Nörd. IX; Phil. Woods 390; Gard. 64; Becc. 569; Ridl. 45; Watt Dict. 2:32; Van Eed. 16; Wiesner 2:974; Janssonius 272–276.

Calophyllum spectabile Willd.

British India, Burma, and the Malay Peninsula.

Mast and spar wood.

Van Eed. 17; Watt Dict. 1:460, 2:32; Ridl. 46; Pierre 107; Janssonius 276–278.

Calophyllum tomentosum Wight. Poon.

Ceylon.

Spar wood.

Watt Dict. 2:32; Gamb. 57; Nörd. X; Lewis 308.

Many other species of *Calophyllum* are used, usually under the name of *entangor* or *bintangor*. They are generally used as spars or masts for small boats. Plate XXVII, fig. 62.

Newt. 4.

Cratoxylon. Plate XXVII, fig. 63. Wood usually with more pronounced concentric lines than in *Calophyllum*.

Cratoxylon neriifolium Kurz.

India and Burma.

Structural wood.

Gamb. 49; Watt Dict. 2:588; Pierre 49.

Cratoxylon glaucum Korth. Gerunggang.

Borneo.

Very soft, light, red wood, for interior finish.

Several other species of *Cratoxylon* occur in Borneo and are often used under the name of *gerunggang*.

Becc. 586.

Garcinia. Hard or moderately hard, close-grained, yellowish-white, red or gray, with numerous characteristic wavy bands of loose texture. Pores scanty, small to large. Pith-rays usually fine.

Garcinia cowa Roxb.
Eastern Bengal, Assam, Chittagong, Burma, and the Andaman Islands.
Gamb. 54; Nörd. IV; Pierre, page XXVIII, 119.

Garcinia speciosa Wall.
Coast of Martaban and Tenasserim.

The beautiful uniformly reddish-brown wood is used principally for house and bridge building.

Watt Dict. 3:477; Pierre, page XIV, 59.
Numerous other Garcinias are used in much the same ways.

Mesua ferrea L. (*M. speciosa* Choisy). Plate XXVII, fig. 64. "Indian rose chestnut;" naga-kesara; pennagah; "the Ceylon or East Indian ironwood or nagasholz."
Wild in India, cultivated in the whole of the East Indies because of the white fragrant flowers and the wood.

Wood somewhat resembling that of *Calophyllum,* but much harder and heavier. Heartwood dark-red, extremely hard. Pores moderate-sized, scanty, often filled with yellow resin, single or grouped or in oblique strings of varying lengths. Pith-rays extremely fine, uniform, equidistant, very numerous. Numerous fine, wavy, concentric lines of dark-colored tissue, regular and prominent, but of very different lengths.

Structural work and furniture. According to Grisard and v. d. Berghe, the wood has an aromatic odor and also bears the name of "Bois d'Anis."

E.-Pr. 3[6]:219; Watt Dict. 5:238; Semler 634; Gamb. 59–61; Nörd. XI; Ridl. 46; Van Eed. 19; Pierre 97.

Ochrocarpus longifolius Benth. & Hook. f.
Western India.

Wood red, hard, close- and even-grained. Pores moderate-sized. Pith-rays moderately broad, very numerous, the distance between them equal to, or less than the diameter of the pores. Seasonal rings marked by a dark line. Lines of soft texture numerous, but indistinct. Numerous resin-ducts in radial long cells, which appear as shining lines on a horizontal, and black spots on a vertical section.

Gamb. 55.

Ochrocarpus siamensis T. And.
Cochin China; cultivated in the whole of Indo-China.

Wood almost as hard as that of *Mesua ferrea* and substituted for it.

Gamb. 56; Pierre 94–96.

Poeciloneuron indicum Bedd.
Western India.

Wood dark-red, heartwood darker, very hard. Pores moderate-sized, ringed, single or in short slanting, irregular lines. Pith-rays fine,

numerous, the distance between them less than the diameter of the pores. Occasionally very short, fine, white, concentrically running lines, especially in the sapwood. Structural work, rice-pounders and firewood.

Gamb. 61.

Kayea stylosa Thw.
Ceylon.

Wood red, moderately hard and very heavy. Pores moderate-sized, in radial strings, which are more or less in echelon and rather scanty. Pith-rays very fine, indistinct. Very fine concentric bands of soft texture across the rays.

Gamb. 59.

DIPTEROCARPACEÆ.

This is, by far, the most important family of the Orient. It is probable that this one group produces more commercial wood than all others of the region together. The trees here are often of large size and they constitute a larger percentage of merchantable stand than is the way with most other groups, outside of the mangrove swamps. In places, as some of the dipterocarp forests in India, certain species form almost pure stands (*sál* and *eng* forests in Burma).

"The most striking peculiarity of this order is, that numerous species are gregarious, forming nearly pure forests of large extent, in which one species has obtained the upper hand, to the exclusion of almost all others. In the tropical forests of eastern Asia, these species play the part which in Europe belongs to trees of Coniferæ and Cupuliferæ—the Scotch pine, the mountain pine, the spruce, and the beech. The most remarkable of these gregarious species is the sál tree, *Shorea robusta*, which forms pure or nearly pure forests of vast extent at the foot of the Himalaya, from Assam to the Punjab, and in the hills of eastern central India extending south to near the Godavery River. In a climate and on soil which suits it, this tree reigns supreme." (Brandis Enumeration of the *Dipterocarpaceae*. Journ. Linn. Soc. Bot. **31**: (1895).)

Very often a number of dipterocarp species are found making up a very large percentage of a given stand.

Many leguminous species have very ornamental wood which is in great demand for furniture and cabinet work, but they do not supply anything like the quantity of wood furnished by the dipterocarps. It is this plentiful supply of usable timber which puts the dipterocarps far in the lead among the oriental timber-producing families.

In many sections the dipterocarps predominate to such an extent that the market conditions would not be seriously changed if all other kinds of wood were taken from the market. It is not to be understood, from what has just been said, that the dipterocarps are unsuited for furniture and cabinet work. There are some members of the family which can be

made up in a decidedly ornamental fashion; but it is as general construction timber, where large quantities of good woods are required, that the dipterocarps are most useful. There are a number of very durable woods in the family and quite a number of fair durability, which are very easily worked.

The family is restricted to the Orient, being found in tropical Asia from the Seychelles to New Guinea.

The wood of the family is characterized by the presence of resin-ducts. These are usually arranged in incomplete concentric lines, and sometimes appear at first sight to represent seasonal rings. However, this irregular occurrence and the incompleteness of the rings is sufficient to show very conclusively that they do not represent such periods of growth. Seasonal rings are never present, so far as known. There is a wide range of color and hardness. Pith-rays fine to moderately broad. Pores small to large. Wood parenchyma irregularly arranged, usually scattered, sometimes in discontinuous tangential lines. Two kinds of pith-rays are sometimes present, as in *Vatica* and some species of *Dipterocarpus.*

The number of species in the family is large and many of them are but incompletely known. When Brandis wrote his Enumeration (1895) there were 325 species known. Since that time, there have been 25 or 30 species described and there are probably quite a number of undescribed species in Sumatra, Borneo and other portions of Malaya.

It seems that nearly all species in the family produce wood which is utilized, most of it commercially; consequently the classification of dipterocarp woods is an undertaking of some magnitude. There are groups of species which correspond in structure and which are marketed under the same name. An effort has been made to group the dipterocarps according to the structural groups and to apply the most used trade names to these groups.

The following seem fairly distinct: *rassak, chengal, yacal, peniow, mangachapuy, mangasinoro, kapor, sál* or *guijo, apitong, tanguile, red lauan, almon, white lauan, mayapis.*

RASSAK. Plate XXVII, fig. 65.

This is variously known as *rassak, resak, resak batu, empadu,* and *narig,* and comes principally from species of *Vatica* and *Cotylelobium.* It is found in Borneo, Sumatra, the Philippines, Ceylon and southern India. Trees of this group are very widely distributed. Singapore seems to be the principal market for the wood. It is probable that some of the wood in the Singapore market under this name is supplied by species of *Shorea.* The supply of *rassak* in Borneo seems to be rather limited. It is increasingly difficult to find large trees. The tree seems less gregarious than is the habit of many other members of the family.

Wood very hard and heavy, close-grained, yellowish-brown. Like *yacal* and *mangachapuy,* it darkens characteristically on exposure to the air. Pith-rays of two sorts, moderately broad and very fine. Pores small or very small, clear and unbordered. Resin very scanty, often difficult to see at all. Wood durable; used for construction work.

Newton 6.

CHENGAL (Penak). Plate XXVII, fig. 66.

This is the best member of this group in the Federated Malay States and Straits Settlements. It is very much the same as *yacal,* but may be distinguished from that wood by the fact that the tangential section always shows distinct parallel transverse lines (ripple marks). The wood is used for railroad ties, telephone and telegraph poles, bridges and construction work. It is very durable and a very satisfactory wood to work. It is produced by different species of the genus *Balanocarpus.*

YACAL. Plate XXVII, fig. 67.

Yacal (Phil.); *selangan batu* (M.); *ballow.* In the Singapore market, this wood is known as *ballow* and has supplanted the "Johore teak" (*Parinarium oblongifolium* Hook. f.), which was the original wood sold under that name. In Burma, the wood which seems to be the commercial equivalent of this is known as *thingan. Yacal* seems to be supplied by *Shorea balangeran* Burck and other species of *Shorea.* Some of it is also supplied by *Hopea odorata* Roxb. and other species of *Hopea.* The name *yacal* seems to be the most used name for this wood. Large quantities of this wood are used in the Philippines for railroad ties. Perhaps the largest place of export for the wood is British North Borneo, where it is locally known as *selangan batu* and *Borneo yacal.*

Wood very hard and heavy to very heavy, brownish when first cut but rapidly darkening on exposure to the air. Always giving a very glistening surface in transverse section. Pores more or less distinctly fringed and with occasional indistinct bands of wood parenchyma. Resin distinctly present. Resin-ducts occasionally forming incomplete concentric lines of lighter color than the surrounding wood. Pith-rays uniform, fine. A very excellent and durable wood, which is said to be free from insect attacks.

Gard. 56; Phil. Woods 396.

MANGACHAPUY. Plate XXVII, fig. 68.

Much like preceding but lighter in color and weight.

This wood is also known by the following names: *gagil* and *selangan batu* No. 2 (British North Borneo); *chengal* No. 2 (Federated Malay States); *kaniongan* (Dutch East Borneo).

The source of this wood seems to be a group of small leaved Hopeas, of which *Hopea acuminata* Merr. is one.

PENIOW.

This is produced by *Shorea grandiflora* Brandis and is found only in Sarawak. It is probably the best member of the family in the region where it occurs. In durability, it is considered as second only to *billian* (*Eusideroxylon zwageri*). Wood very hard, very heavy and very resinous. More uniformly yellowish-brown than any of the preceding. Used for piling, corner posts, wherever great strength and durability are required.

KAPOR. Plate XXVII, fig. 69.

Found in Borneo, Sumatra and the Malay Peninsula and some of the islands of the Malay Archipelago. The Dutch call it "kampferhout," and the English, "Borneo camphorwood." Wood reddish, very straight-grained. Resin-ducts not abundant. Pores medium-sized, not fringed, and wood parenchyma scanty. Occasionally a faint odor of camphor in the wood. Ripple marks occasionally present on longitudinal sections. Used for piling, planking, etc. Easily worked and much in demand. Produced by the species of the genus *Dryobalanops*.

GUIJO (Phil.); SÁL (Burma); TEKAM (Sarawak); SELANGAN BATU MIREH (British North Borneo). Plate XXVII, fig. 70.

In the Philippines, where it is known as a shipbuilding wood, it is produced by *Shorea guiso* Bl. In Burma it is known as *sál* and occurs in solid stands. It is here the product of *Shorea robusta* Gaertn. Wood hard and moderately heavy to heavy. Wood parenchyma present in some quantity, sometimes faintly fringing the vessels and often forming indistinct concentric lines. Resin-ducts not infrequent. Grain crooked. This is an exceedingly good wood, but it is very likely to warp badly unless carefully seasoned. Used for house and shipbuilding, planks, carriage building, etc.

Gard. 55; Phil. Woods 384.

APITONG (Phil.); KRUEN (M.); ENG (Burma). Plate XXVII, fig. 71.

Quite a number of species of *Dipterocarpus* produce wood of this grade. The most widely distributed seems to be *Dipterocarpus grandiflorus* Blanco, which is found in the Philippine Islands, in northern and western Borneo and on the Malay Peninsula. In the Philippines the name *apitong* is used. In northern and western Borneo and on the Malay Peninsula the name *kruen* is used for the same and related species. In east Borneo the name *tampoerouw* or *tampoedow* is found for wood which is probably mainly the product of *Dipterocarpus tampurau* Korth. In Burma, the *eng*, which is the product of *Dipterocarpus tuberculatus* Roxb., is a wood of this quality, as is also the wood of *Dipterocarpus turbinatus* Gaertn. f., the *gurjun* of India, and *Dipterocarpus*

zeylanicus Thw., the *horá* of Ceylon. The quality of the wood varies to some extent in the same species under different conditions, and in different species; but, as a genus, *Dipterocarpus* has rather uniform wood. A number of different grades of *apitong* are recognized in the Philippine Islands.

Wood moderately hard to hard and moderately heavy. Pale-grayish-red, sometimes with a faint purplish tinge. Pores large and more or less distinctly fringed. Wood parenchyma often rather copious. Resin-ducts numerous and evident. Wood sometimes rather close-grained, resembling *guijo* or *sál,* and sometimes rather coarse and open-grained. Rather easily worked. Used for heavy structural work, planks, etc. Very suitable for railroad ties, wherever the termites are not bad. Other grades of this wood are known in the Philippines as *panao* or *hagachac.*

TANGUILE (Phil.); KLAPAK (Dutch Borneo); OBAR SULUK. Plate XXVII, fig. 72.

In the Philippines, this wood is supplied by *Shorea polysperma* (Blanco) Merr. It seems to be identical with the wood known as *klapak* in Dutch East Borneo and *obar suluk* in British North Borneo. Wood soft to moderately hard; light. Red, close- and straight-grained. Pores of medium size. Resin white and hard, frequently forming conspicuous hard lines. This wood works very well and is exceedingly well suited for interior finish. It is being sold as "Philippine mahogany." It is of course not a mahogany at all; but, for interior finish, it makes a pretty substitute.

Gard. 58; Phil. Woods 394.

RED LAUAN (Phil.); MERANTI (M.); SERIAH MERAH (M.). Plate XXVII, fig. 73.

The product of several species of *Shorea* (possibly also of *Hopea*) and seemingly identical with the *meranti* of Borneo and Malaya and the *seriah merah* of British North Borneo and the Malay Archipelago. Wood soft or very soft and light. Pale-reddish. Pores large, sometimes showing dark glistening deposits. Resin-ducts rather numerous, filled with whitish deposits. Used for light furniture and light or temporary construction. The softer pieces are well suited for pattern work.

Newton 2; Gard. 53; Phil. Woods 386.

MANGASINORO (Phil.); SERIAH PUTEH (British North Borneo). Plate XXVII, fig. 78.

This seems to be the product of some species of *Shorea* in the Philippines and it is identical in structure and appearance with the *seriah puteh* of British North Borneo and the *bangkirai* of Dutch East Borneo. Wood

yellowish-white, soft and light. Pores arranged in a fairly regular reticulate pattern, and resin-ducts almost entirely absent. Easily worked; used for planks, etc.

PALOSAPIS OR MAYAPIS. Plate XXVIII, fig. 74.

This is produced by species of *Anisoptera* in the Philippines. It seems to be the same as the *mersawa* of the Federated Malay States and the *mirauan* of Sarawak. Wood yellowish-white; pith-rays of two sorts, moderately broad and fine. Pores of medium size. Resin-ducts rather distinct. Wood of young trees coarse-grained and brittle, rather difficult to work. Wood from well-grown trees is of very good quality and seems to be fairly durable. Used for planks, crossbeams, etc.

Gard. 66; Phil. Woods 389.

WHITE LAUAN. Plate XXVIII, fig. 75.

This is produced in the Philippines by *Parashorea plicata* Brandis and *Pentacme contorta* (Vid.) Merr. & Rolfe. It occurs in British North Borneo under the name of *gagil* and *urat mata* and in the Straits Settlements as a poor grade of *seriah*. It is possible that some species of *Shorea* and *Hopea* also produce wood which is sold under this name. Wood grayish-white or brownish-gray; soft and light, not durable. Pith-rays of two kinds, moderately broad and fine. Resin-ducts numerous, often forming incomplete concentric lines, falsely resembling seasonal rings. Wood used for various forms of light or temporary construction.

Phil. Woods 386; Gard. 52.

ALMON.

This is a good grade of *lauan,* with a pinkish or reddish color. It is often exactly the equivalent of some grades of *meranti* and *seriah*. It is probably produced by different species of *Shorea* and possibly also *Hopea*. It is a very good wood for light construction and interior finish. The structure of this wood is very much the same as that of *tanguile,* but it is usually much softer and lighter in color than that wood. In some parts of Luzon this wood is known as *mayapis*.

The soft red-wooded dipterocarps are very common, but they are not yet very clearly understood. *Tanguile, red lauan* and *almon* are frequently confused. The best qualities of *tanguile* are conspicuously darker in color and harder than the other two woods, and *red lauan* is usually distinctly coarser grained than either *almon* or *tanguile,* but there are numerous intermediate grades of these woods which may belong to any one of the three.

In spite of our present fragmentary knowledge of the group, it has seemed entirely feasible to prepare the following key to the commercial dipterocarps.

KEY TO DIPTEROCARP WOODS.

a. Wood hard and moderately heavy to very heavy.
  b. Yellowish-brown or whitish when first cut.
    c. Resin very scanty; pith-rays evidently of two kinds; pores small.... *Resak*
    cc. Resin distinctly present in whitish concentric lines.
      d. Distinct parallel transverse lines on tangential section..... *Chengal*
      dd. Lines not present as above.
        e. With glistening fracture.
          f. Straw-color or almost white when fresh..... *Mangachapuy*
          ff. Light- to dark-brown..... *Yacal*
        ee. Without glistening fracture..... *Peniow*
  bb. With distinct reddish color.
    c. Resin not abundant; very straight-grained..... *Kapor*
    cc. Resin abundant, not so straight-grained.
      d. Pores medium size..... *Guijo*
      dd. Pores large ..... *Apitong*
aa. Wood moderately hard or soft; light to moderately heavy.
  b. Distinctly reddish.
    c. Vessels of medium size or small; wood fine-grained..... *Tanguile*
    cc. Vessels large ..... *Red lauan*
  bb. Usually white or yellowish, reddish tinge faint, if present.
    c. Yellowish-white.
      d. Pores in definite patterns..... *Mangasinoro*
      dd. Pores scattered ..... *Palosapis*
    cc. Grayish-white or with faint pinkish tinge.
      d. Faint pinkish tinge present..... *Almon*
      dd. Grayish-white or with slight brownish tinge..... *White lauan*

SPECIES NOTES.

The following notes are intended to serve as a list of the better known commercial species and to indicate the distribution and give the more important literature on the wood of each.

Anisoptera glabra Kurz. Thinkadu (Burma).
British India, Burma, Malay Peninsula.

Used in boat building.

Ridl. 60; Gamb. 73.

Anisoptera palembanica Miq. Basoeng (Sumatra).
Van Eed. 26.

Anisoptera thurifera Blanco. Plate XXVIII, fig. 74. Mayapis or Palosapis.
Philippines.
Phil. Woods 389.

Balanocarpus maximus King. Chenghei; penak (M.).
Malay Peninsula.
Ridl. 62.

Balanocarpus penangianus King. Damar hitam (M.).
Malay Peninsula.
Ridl. 62.

Cotylelobium flavum Pierre. Rassak durian.
Sarawak.

Used in boat building.

Becc. 570.

Cotylelobium melanoxylon Pierre (*Anisoptera melanoxylon* Hook.). Resak (M.).
Borneo.

The shining brown heartwood is much prized. Next to *Dryobalanops*, perhaps the most valuable tree in Labuan.

E.-Pr. 3[6]:268; Brandis Enum. 115.

Dipterocarpus alatus Roxb. Kanyinbyu (Búrma).
British India and Burma.

House building and canoes.

Gamb. 72; Nörd. VIII; Pierre 212.

Dipterocarpus eurhynchus Miq. Kroewing (M.).
Sumatra, Riouw.
Van Eed. 26.

Dipterocarpus gracilis Bl. Palaglar.
Java.
K. & V. 5:117; Janssonius 1:358.

Dipterocarpus grandiflorus Blanco. Plate XXVII, fig. 71. Apitong (Phil.); kruen (M.).
Philippines, British North Borneo, Malay Peninsula, Banka.
Phil. Woods 372; Ridl. 55.

Dipterocarpus hasseltii Bl. Hagachac (Phil.).
Java, Philippines.
Phil. Woods 373; K. & V. 5:109–111; Janssonius 1:359.

Dipterocarpus insularis Hance.
Cochin China.
Pierre 214; Janssonius 1:348.

Dipterocarpus littoralis Bl. Lalar.
Java.
K. &. V. 5:114; Janssonius 1:348.

Dipterocarpus lowii Hook. f. Kruyn (M.).
Sarawak.
Bargagli-Petrucci 60–62; Becc. 569.

Dipterocarpus retusus Bl. Palaglar-mienjak (M.).
Java.
K. & V. 5:112–114.

Dipterocarpus tampurau Korth. Tampoerouw or tampoedau.
South and east Borneo.

Dipterocarpus trinervis Bl. Boembang; palalaglar; palaglar-mienjak; klalar; mesegar.
Java, Sumatra.
Van Eed. 26; K. & V. 5:105–109; Janssonius 1:354.

Dipterocarpus tuberculatus Roxb. Eng, in (Burm.).
British India and Burma, Cochin China.

Reddish-brown, heavy, but readily worked wood. Used for structural work.

Pierre 218; Watt Dict. 3:160; Gamb. 72, *tab. II, fig. 1;* Nörd. V (*D. grandiflorus* Wall.), XI.

Dipterocarpus turbinatus Gaertn. f. (*D. laevis* Ham.). Kanyin (Burm.); gurjun (Beng.).
British India and the Andaman Islands.

Red, moderately hard wood; used for house and boat building.

Watt Dict. 3:170; Gamb. 70.

Dipterocarpus vernicifluus Blanco. Panao.
Philippines.
Phil. Woods 373.

Dipterocarpus zeylanicus Thw. Hora.
Ceylon.
Gamb. 72.

Doona congestiflora Thw. Tinya.
Ceylon.
Used for tea-boxes.

Lewis 308.

Doona gardneri Thw.
Ceylon.

Wood hard, even-grained, durable, reddish-brown; called "red doon" by sawyers in the hill country, and used for sleepers in the Haputale railway.

Doona zeylanica Thw. Dun, doon.
Ceylon.

Wood light, moderately hard, pale-grayish-brown, durable and greatly in request for shingles, whence the tree is often called "shingle tree."

Gamb. 74.

Dryobalanops aromatica Gaertn. f. Kapor; kampferhout; Borneo camphor wood.
Borneo, Sumatra, Malacca.
Van Eed. 27; Ridl. 61; Newton 6.

Dryobalanops beccarii Dyer. Kapor gunong and kapor paya (M.).
Sarawak.
Becc. 572; Bargagli-Petrucci 73.

Dryobalanops kayanensis Becc. Kapor bennar.
Sarawak.
Becc. 572; Bargagli-Petrucci 74.

Other species of *Dryobalanops* furnish wood which is not to be distinguished from that of the species mentioned.

Hopea acuminata Merr. Plate XXVII, fig. 68. Mangachapuy or dalindingan.
Philippines.
Phil. Woods 389; Gard. 68.

Hopea beccariana Burck. Mahan besi; mangbesi.
Sarawak.
Bargagli-Petrucci 70; Becc. 572.

Hopea dryobalanoides Miq. Dammar-mata-koetjing; dammar-poetih.
Sumatra.

Hopea fagifolia Miq. Kawang; djempina; tjengal.
Banka, Java.
Van Eed. 27; K. & V. 5:124–126; Janssonius 1:369–374.

Hopea ferrea Pierre.
Cochin China.
Pierre 249.

Hopea grisea Brandis. Lon putte; loon putih.
Sarawak.
Becc. 571; Bargagli-Petrucci 71.

Hopea intermedia King. Jankang; merawan kunyit; mengarawan.
Malay Peninsula.
Ridl. 59.

Hopea mengarawan Miq. Ngarawan; mengrawan; tjinkang; maranti.
Sumatra, Banka.
Van Eed. 28.

Hopea myrtifolia Miq. Mengarawan.
Sumatra.
Van Eed. 28.

Hopea odorata Roxb. Thingan (Burma); sao (Anam).
British India and Burma, Andaman Islands, Cochin China, Borneo.

Yellowish-brown, moderately hard and heavy; easy to work; not subject to insect attack. Said to combine many of the good points of oak with the durability of teak. Much the same wood as *yacal*. In demand for all kinds of building.

Pierre 224; Gamb. 75, *tab. II, fig. 2;* Nörd. IX.

Hopea pierrei Hance.
Cochin China.
Pierre 248.

Hopea philippinensis Dyer.
Philippines.

Hopea plagata Vidal.
Philippines.
Phil. Woods 396.

Hopea treubii Heim. Mar akka.
Sarawak.
Becc. 571; Bargagli-Petrucci 72.

Hopea wightiana Wall.
British India.
Gamb. 74.

Isoptera borneensis Scheff.
Borneo, Banka, Malay Peninsula.
Becc. 571.

Monoporanda cordifolia Thw.
Ceylon.

Pachinocarpus umbonatus Hook. f.
Borneo.

Soft white wood.

E.-Pr. 3^{6}:270.

Parashorea plicata Brandis. White lauan.
Philippines.
Phil. Woods 386.

Parashorea stellata Kurz. (*Shorea stellata* Dyer.) Chengal (M.); thingadu (Burm.); kaunghmu (Burm.).
Burma, Malacca, Cochin China.

Brownish-white, moderately hard. Used for boat building.

Gamb. 83; Watt Dict. 6^{2}:678; Ridl. in Agric. Bull. F. M. S. & S. S. 6 (1907) 170.

Pentacme contorta (Vid.) Merr. & Rolfe. White lauan.
Philippines.
Phil. Woods 386.

Pentacme suavis A. DC. (*P. siamensis* Kurz). Ingyin (Burm.).
Burma, Cochin China.

Wood very hard, very heavy, cross-grained, in this respect similar to *sál* which it also resembles in color. Very durable, indestructible in water. Wood fibers diaphragmed with delicate cross-walls; the vessels form short radial rows; the pith-rays are usually two cells wide and have crystal-bearing border cells.

Gamb. 77; Nörd. IV (*Hopea suavis* Wall.); E.-Pr. 3^{6}:263; Watt Dict. 6^{2}:678; Pierre 225–227.

Shorea acuminata Dyer. Rambeh daun; maranti payah.
Malay Peninsula.
Ridl. 58.

Shorea aptera Burck. (*Hopea balangeran* de Vr., not Korth.) Minjak tengkawang.
Borneo.
Burck in Ann. Jard. Bot. Buitenz. 6 (1887) 210.

Shorea assamica Dyer. Makai.
Assam.
Gamb. 83.

Shorea balangeran Burck. (*Hopea balangeran* Korth.; *Parahopea balangeran* Heim.) Yacal (Phil.); njating-mahambong; tengjawang-blongseng; tengkawang-seloengsoeng; balangeran (M.).
Banka, Borneo, Philippines.

This furnishes a part of the *yacal* of the Philippines, and probably, also, a part of the *selangan batu* of British North Borneo.

Phil. Woods 396; Burck l. c. 214.

Shorea barbata Brandis. Resak.
Malay Peninsula.
Ridl. 59.

Shorea brachyptera Heim. Mangkabang assu.
Sarawak.
Becc. 571; Bargagli-Petrucci 67.

Shorea compressa Burck.
Borneo.
Van Eed. 28.

Shorea curtisii King. Meranti; tahi.
Malay Peninsula.
Ridl. 58.

Shorea elliptica Burck. Merawan mera.
Sarawak.
Becc. 571; Bargagli-Petrucci 66.

Shorea eximia Scheff. Koejoeng.
Banka, Sumatra.
Van Eed. 28.

Shorea falcifera Dyer. Mengkabang pinang.
Sarawak.
Bargagli-Petrucci 65; Becc. 571.

Shorea ferruginea Dyer. Sassak suppok.
Sarawak.
Becc. 571; Bargagli-Petrucci 64.

Shorea furfuracea Miq. Maranti.
Sumatra.
Burck l. c. 219.

Shorea ghysbertsiana Burck. Mengkabang pinang.
Borneo.

A fine-grained, hard, red wood, resembling *guijo*.

Becc. 571.

Shorea glauca King. Balau.
Malay Peninsula.

Wood dark-brown in color and heavy, with numerous small pores, and close fine rays. Much resembles *damar laut* (*Shorea utilis*).

Ridl. in Agric. Bull. F. M. S. & S. S. **6** (1907) 171.

Shorea gratissima Dyer.
Singapore.
Ridl. 59.

Shorea guiso (Blanco) Blume. Plate XXVII, fig. 70. Guijo.
Philippines.
Phil. Woods 384; Gard. 55.

Shorea hypochra Hance. Vin-vin.
Cochin China.

The hard, yellow heartwood is much prized.

Pierre 228.

Shorea javanica K. & V. Plalar.
Java.
K. & V. 5:121.

Shorea leprosula Miq. Seraya batu; laro (M.).
Malay Peninsula, Borneo.
Ridl. 55; Becc. 571; Bargagli-Petrucci 64.

Shorea macroptera Dyer. Kepong; kepong hantu; sassak (M.).
Malay Peninsula, Borneo.
Ridl. 57; Bargagli-Petrucci 63; Becc. 571.

Shorea maranti Burck. (*Hopea ? maranti* Miq.) Meranti.
Malacca, Sumatra, Banka.
Ridl. 55–57; Van Eed. 27.

Shorea martiniana Scheff. (*Hopea macrophylla* de Vr.) Tengkawang-lajar.
Borneo.
Burck l. c. 208.

Shorea nitens Miq. Maranti bras; sengkawang.
Sumatra.
Van Eed. 28.

Shorea obtusa Wall. Thitya (Burm.).
Burma.
Gamb. 82.

Shorea palembanica Miq. Melebekan.
Sumatra.
Van Eed. 28.

Shorea parvifolia Dyer. Serayah samak; meranti daun kechil; meranti kerap.
Malay Peninsula.
Ridl. 57.

Shorea platycarpa Heim. Mranti boaya.
Sarawak.
Bargagli-Petrucci 67; Becc. 570.

Shorea polysperma Merr. Plate XXVIII, fig. 73. Tanguile.
Philippines.
Phil. Woods 394; Gard. 58.

Shorea robusta Gaertn. Sâl (Hind.).
British India, Burma, Cochin China.

Sapwood small, whitish, not durable; heartwood brown, pale when first cut, but darkening on exposure, coarse-grained, hard, with a remarkable fibrous and cross-grained structure; the fibers of alternate belts in the wood on a vertical section running in opposite directions, so that when the wood is dressed, a very sharp plane is necessary or it will not get smooth; does not season well. Seasonal rings only visible in young trees or on freshly cut wood. Pores moderate-sized to large, often filled with resin; each pore or group of pores in a patch of pale, loose tissue. Pith-rays uniform, moderately broad, straight, very prominent, joined

by short white transverse lines, the distance between the pith-rays equal to the transverse diameter of the pores. Pith-rays mostly four cells wide with cubical border cells. The most important structural wood of northern India. Used also for joinery and railroad ties.

Janssonius 1:364–369; E.-Pr. 3⁶:266; Gamb. 77–81, *tab. II, fig. 3;* Nörd. V; Watt Dict. 6²:677.

Shorea selanica Bl. (*Hopea selanica* Roxb.) Dammar-sila; dammar-malaijoe; bahoet; kajoe-bapa; bapa-mereh; bapa-puti.
Borneo, Moluccas.
Van Eed. 28.

Shorea sericea Dyer.
Malay Peninsula.
Ridl. 58.

Shorea squamata Benth. & Hook. f.
Borneo, Philippines.
Becc. 570.

Shorea talura Roxb. Talura (Tam.).
British India.
Gamb. 82.

Shorea tumbaggaia Roxb. Tambugai (Tam.); cangu.
British India.

The wood, which is harder than that of *sál,* though otherwise similar, is used in structural work.

Watt Dict. 6²:679; Gamb. 81.

Shorea utilis King. Damar laut numero satu.
Malay Peninsula.

A very useful and durable wood. Used for structural work, piling, etc.

Ridl. 58; Newton 6.

Stemonoporus wightii Thw. Halmendora.
Ceylon.
Gamb. 85.

Vateria acuminata Hayne.
Ceylon; frequently planted.

Light but hard and durable wood, with thin-walled wood cells. Vessels single or in small groups. Used for tea-chests and structural work.

Lewis 308.

Vateria indica L. Piney maram; "the piney varnish tree."
British India.

Rough, coarse-grained, moderately hard wood with reddish-white sap and gray heart. Used for boats, masts, coffins, tea-chests, packing cases, etc.

Gamb. 85, *tab. II, fig. 4;* Nörd. V; Watt Dict. 6²:225.

Vateria seychellarum Dyer.
Seychelles.

Wood of this rare tree much valued because of the large amount of oil which it contains.

E.-Pr. 3[6]:273.

Vatica (Synaptea) astrotricha Pierre.
Cochin China.

Yellow-brown to reddish or greenish, black-streaked, very durable. Used for structural work and furniture.

Pierre 240.

Vatica bancana Scheff.
Banka, Java.
K. & V. 5:127–129; Janssonius 1:360–364.

Vatica bantamensis Burck.
Java, Sumatra.
K. & V. 5:129.

Vatica cinerea King. Pinang baik.
Malay Peninsula.
Ridl. 60.

Vatica chinensis L.
British India and Ceylon.

Reddish-brown, hard, close-grained.

Gamb. 84.

Vatica (Synaptea) faginea Pierre.
Cochin China.
Pierre 242.

Vatica mangachapoi Blanco. Narig (Phil.).
Philippines.

Vatica rassak Korth. Rassak; njating; dammara.
Dutch Borneo.

It seems probable that quite a number of species produce timber which is known as *rassak*. In some places the wood of *Vatica* is known as *tjengal*.

TAMARICACEÆ.

Tamarix articulata Vahl.
Africa, Arabia, Java, British India.

White, moderately hard wood, used for cart wheels, agricultural implements, etc.

Watt Dict. 6[3]:409; Gamb. 46; Nörd. VI.

Tamarix gallica L.
India, Burma, Ceylon.

Wood white or reddish, sometimes darker in the center, but no heartwood. Pores small to moderate-sized, often in groups, more numerous

and large in the earlier-formed wood if the seasonable rings are distinct. Pith-rays generally broad, short, distant, giving a marked silver grain.

Gamb. 46; Nörd. I.

FLACOURTIACEÆ.

Wood usually reddish-brown, moderately hard or hard. Pores small, in short radial lines. Pith-rays fine, numerous, closely packed. The structure closely resembles that of the red-wooded section of *Euphorbiaceæ*.

Casearia glomerata Roxb.
British India to Hongkong and Java.

Yellowish-white, moderately hard, coarse wood.

Watt Dict. 2:209; Gamb. 378, *tab. VIII, fig. 5;* Nörd. X.

Casearia tomentosa Roxb.
British India to Java and north Australia.

Wood similar to the preceding and used for making combs.

Gamb. 379; Watt Dict. 2:209; K. & V. 1:176–178.

Flacourtia cataphracta Roxb.
British India and Burma.

K. & V. 5:26–28; Gamb. 39, *tab. I, fig. 3;* Nörd. IX; Van Eed. 11; Janssonius 1:209; Ridl. 11.

Flacourtia ramontchi L'Herit. "Madagascar-plum."
India, Burma, Ceylon; cultivated in Egypt and throughout southern Asia.

Red, hard, close- and even-grained, splits but does not warp, and is durable. Pores small, in radial lines. Pith-rays fine, uniform, closely packed and somewhat wavy. Agricultural implements and turnery.

Watt Dict. 3:399; Gamb. 40; Van Eed. 12; K. & V. 5:19–22; Janssonius 1:208.

Gynocardia odorata R. Br.
British India.

Yellow or yellowish-brown wood; used for rough structural work.

Watt Dict. 4:194; Gamb. 41.

Homalium frutescens King. Petaling ayer.
Malay Peninsula.

A fine-grained wood, suitable for building.

Ridl. 180.

Homalium tomentosum Benth. Dalingsem.
Java to Burma.

A hard and heavy structural wood.

K. & V. 1:182–185; Van Eed. 149.

Homalium luzoniense F.-Vill. (Plate XXVIII, fig. 79), and other species. Aranga.
Philippines.

A very hard and durable wood. Reddish, close-grained. Pith-rays very fine and very numerous, turning out to pass vessels. Vessels medium-size, scattered. Used for piling and structural work. Considered by many as the best wood for piling in the Philippines.

Phil. Woods 373; Gard. 63.

Hydnocarpus alpina Wight.
India and Ceylon.

Light-brown, hard, with streaks of darker color and clearly containing tannin. Seasonal rings faint. Pores moderate-sized, often subdivided radially into 2 or 3, scanty. Pith-rays fine, very numerous and closely packed, the distances between them much less that the transverse diameter of the pores. Used for beams and rafters and a good fuel.

Gamb. 42.

Pangium edule Reinw. Putjung; pangi.
Malay Archipelago.

A hard wood; used for house building.

Van Eed. 12; Janssonius 1:211; K. & V. 5:6–8.

Trichadenia zeylanica Thw. Tolol (Cingh.).
Ceylon.

Wood yellowish-white, hard. Pores moderate-sized, often subdivided, rather scanty, in radial patches. Pith-rays fine, very close, regular, bent round the pores.

Gamb. 41.

DATISCACEÆ.

Tetrameles nudiflora R. Br.
India and Ceylon.

White and soft. Seasonal rings marked by a belt of close pores. Wood cells large. Pores large, often subdivided and in short zigzag transverse lines. Pith-rays fine to moderately broad, clearly marked, the distance between the rays equal to the diameter of the pores. Tea-chests.

Gamb. 381; K. & V. 9:37–40; Van Eed. 150; Lewis 309.

Octomeles sumatrana Miq. Plate XXVIII, fig. 80. Binuang (Phil.); minuang (M.); kajoe-palaka (M.).
Sumatra, Borneo, Philippines.

Wood soft, yellowish, not durable.

Van Eed. 150; Becc. 579.

THYMELAEACEÆ.

Aquilaria agallocha Roxb. Kayu-garu (M.).
British India and Malaya.

Wood white, soft and light, even-grained, scented when fresh cut. In the interior of old trees are sometimes found irregular masses of harder and darker-colored wood, with a honey-like scent, which constitute the "eaglewood" of commerce. Pores small and moderate-sized, in short radial lines. Pith-rays fine, numerous; the distance between two consecutive rays less than the transverse diameter of the pores. Numerous short transverse bands of pores and intercellular ducts filled with a brownish substance. A valuable incense wood. (See p. 427.)

Gamb. 579.
Aquilaria malaccensis Lam., and other species also furnish *eaglewood*.

LYTHRACEÆ.

Wood grayish or reddish-brown, moderately hard. Pores of various sizes, joined by narrow bands of wood parenchyma. Pith-rays fine, numerous, uniform, usually bent around the pores.

Lagerstroemia floribunda Jack.
Tropical Asia.

Wood light-fawn-colored with the rings usually very distinct and large, sometimes rather close, rays fine and close, rather obscure, pores of medium size in lines along the rings, the rings being marked out by lines of large pores.

Ridl. 179.

Lagerstroemia hexaptera Miq. Bungah malukut.
Malay Peninsula.
Ridl. 179.

Lagerstroemia parviflora Roxb.
Tropical Asia.

Wood very hard, gray or grayish-brown, often almost red, darker-colored near the center, hard. No seasonal rings. Pores moderate-sized and large, often subdivided, surrounded singly or in patches by pale rings, which are joined by fine narrow, irregular, wavy, interrupted and anastomosing bands of wood parenchyma. Pith-rays fine, very numerous, inconspicuous. Used for house posts, beams and rafters, frames for doors and windows, pieces for agricultural implements, carts and boats.

Gamb. 371; Nörd. X; Watt Dict. 4:584.

Lagerstroemia piriformis Koehne (*L. batitinan* Vid.). Batitinan.
Philippines.

Wood hard and moderately heavy. Sapwood light; heartwood dark-brown. Fine straight grain. Seasonal rings distinct. Ring porous. Black glistening deposits in the vessels. Used for general construction; posts, sleepers, flooring, joists, planks, rafters; shipbuilding, keelsons, masts; piles; telegraph poles.

Phil. Woods 377; Gard. 65.

Lagerstroemia speciosa (L.) Pers. (*L. flos-regine* Retz.). Plate XXVIII, fig. 81. Jarul (Beng.); banaba (Phil.); bongoh, boengoer (M.).
Throughout the eastern tropics.

Moderately heavy and hard. Sapwood light to pinkish; heartwood dark-reddish-brown or light-red. Seasonal rings distinct. Ring-porous. Straight-grained. Dark-colored, glistening deposits in the vessels. Used for high-grade construction, boat building, interior partitions and furnishings; planks, rafters, sills, wharves; piling; furniture; carabao yokes; barrels; railroad ties. Considered as almost the equal of teak.

Phil. Woods 374; Becc. 579; Gamb. 373, *tab. VIII, fig. 4;* Nörd. X; Watt Dict. 4:582; K. & V. 1:190–193; Van Eed. 146; Watt in Agric. Ledger (1907) No. 9, 1–7.

Several other species also produce wood of very good quality.

SONNERATIACEÆ.

Crypteronia paniculata Bl. Krakas; tjelemgan; kajoe-ramo (M.).
British India, Malay Peninsula and Malay Archipelago.

Wood light-reddish-brown, moderately hard. Pores moderate-sized, scanty, usually subdivided radially. Pith-rays very numerous, fine, red, inconspicuous. Used for cabinet work. Other species used in the same manner.

Gamb. 370; Van Eed. 145; Ridl. 180; K. & V. 1:203–205.

Duabanga grandiflora (Roxb.) Ham. (*Duabanga sonneratioides* Ham.; *Lagerstroemia grandiflora* Roxb.).
British India and Burma.

Wood gray, often streaked with yellow, soft, seasons well, neither warps nor splits. Pores large and moderate-sized, often oval and subdivided, in roughly oblique lines. Pith-rays fine, very numerous, wavy. Used for canoes, tea-boxes, etc.

Gamb. 376; Watt Dict. 3:196; Ridl. 179.

Duabanga moluccana Bl. Loctob (Phil.); takir, kedjimas (Java).
Philippines, Celebes, Java, Amboina, Bali.

Wood soft, light-colored, not durable. Used for planks and small boats.

K. & V. 1:195–197; Van Eed. 145.

Sonneratia acida L. f. Pedada, p'dada (M.).
British India, Ceylon, Burma, Malay Archipelago.

Wood gray, soft, even-grained. Pores small, oval and subdivided, very

numerous, uniformly distributed. Pith-rays very fine, very numerous, bent around the pores. Used for models and fuel.

Gamb. 377; Nörd. X; Watt Dict. 6³:275; Becc. 579; Van Eed. 147; K. & V. 1:198–200; Bargagli-Petrucci 76, *tab. XIV*.

Sonneratia apetala Ham.
British India, Burma, Ceylon.

Moderately hard; sapwood gray; heartwood reddish-brown. Used for house building, packing boxes, planks, fuel.

Gamb. 376; Watt Dict. 6³:196.

Sonneratia pagatpat Blanco. Plate XXVIII, fig. 82. Pagatpat (Phil.).

Sonneratia alba Smith. Prapat (M.).
These two species are very much alike and may be identical. The outer part of the mangrove swamp. Throughout the Malay region.

Wood hard and heavy, fine-grained, with slightly disagreeable odor. Sapwood white or grayish, heartwood dark-brown and taking up most of the log, sapwood in a rather narrow layer. Pores small and scattered. Works readily, but contains quite a large amount of salt and, consequently, is said to cause nails or spikes to rust quickly. Shavings salty to the taste. Air-dry wood sometimes contains as much as 1 per cent of its weight of salt. In some parts of Borneo the natives secure salt from the ashes of the wood. Used for house building, planking for boats, wall plates, bridges and all parts of structures which come in contact with metal work; used also for telegraph and telephone poles. It should be tried for railroad ties. The air-roots of this tree are very corky and light. They are commonly known in the Philippines by the name of *daluru* and are used as razor hones. (See p. 427.)

Van Eed. 148; K. & V. 1:200; Becc. 579.

LECYTHIDACEÆ.

Barringtonia acutangula Gaertn. Indian oak.
From the Seychelles to north Australia and Queensland.

White, shining, soft, even-grained. Pores small, often subdivided or in radial groups between the broad and very broad, rarely fine and moderately broad, long pith-rays, which form the greater part of the wood, and show a handsome silver grain on radial section. Boat building and joinery.

Gamb. 363, *tab. VIII, fig. 3;* Nörd. X; Watt Dict. 1:402.

Barringtonia racemosa Bl. Nivar.
British India, Ceylon, Malay Archipelago.

Wood white, very soft, porous. Pores small and moderate-sized, numerous, uniformly distributed. Pith-rays moderately broad, long, equidistant. Used principally for fuel.

Gamb. 363; Van Eed. 131; K. & V. 6:6–8.

Barringtonia speciosa Forst. Putat.
Malay Archipelago.

Wood like the preceding. A number of species of this genus furnish wood of this grade. They are usually known by the name of *putat* and are not of much commercial importance.

K. & V. 6:4–6; Van Eed. 131; Ridl. 178.

Careya arborea Roxb.
India.

Wood moderately hard; sapwood whitish, large; heartwood dull-red, sometimes claret-colored, very dark in old trees, even-grained. Pores oval, moderate-sized to large, subdivided, wavy on vertical section. Pith-rays numerous, fine, equidistant and uniform; the space between two consecutive rays less than the diameter of the pores, around which they bend. Across the pith-rays are numerous very fine transverse bars, not easily seen except on a thin section. Durable. Agricultural implements, gun-stocks, house-posts, planking, carts, furniture and cabinet work.

Gamb. 364; Nörd. X; Watt Dict. 2:157.

Planchonia valida Bl. (*P. littoralis* Van Houtte).
Andaman Islands and the Malay Archipelago.

Wood reddish-brown, with yellow streaks, very hard and very heavy, close-grained. Pores moderate-sized and large, often subdivided, in rounded and elongated patches, which are sometimes joined by narrow, undulating bands of softer tissue. Pith-rays very fine, numerous, bending. The pores are frequently filled up by a yellow substance, and are prominent on a vertical section. Seasons well and takes a fine polish.

Gamb. 365; Watt Dict. 6[1]:284; Van Eed. 139; K. & V. 6:24–26.

RHIZOPHORACEÆ.

Hard and usually heavy-wooded trees. *Rhizophora, Ceriops,* and *Bruguiera* have small pores and equidistant, fine or moderately broad rays. The pores are sometimes joined by interrupted concentric bands. The structure of *Kandelia* is different. *Carallia* and *Anisophyllea* differ by having two classes of medullary rays; short very fine rays between the regular broad ones.

Pith-rays broad, of two classes.
- Wood heavy or very heavy ..... *Carallia*
- Wood only moderately heavy ..... *Gynotroches*, *Anisophyllea*

Pith-rays fine or moderately broad.
- Pith-rays yellow, contrasting with the rest of the wood ..... *Kandelia*
- Pith-rays not very different in color from the rest of the wood.
  - Wood orange-colored and giving a fluorescent orange-colored aqueous solution. *Ceriops*
  - Wood not orange ..... *Rhizophora*, *Bruguiera*

Anisophyllea zeylanica Benth.
Ceylon.

Moderately hard and heavy. Grayish-brown. Tea-boxes.

Gamb. 336; Lewis 307.

Bruguiera caryophylloides Blume. Kakandan (Tam.); Bosung (M.).
Tidal forests of India and Burma, rare in Ceylon; Philippines, New Guinea.

Wood reddish, hard and heavy, close-grained. Pores small, scanty, often subdivided. Pith-rays fine, numerous, wavy, with a pretty silver grain.

Gamb. 334; K. & V. 4:298–300; Ridl. 172.

Bruguiera eriopetala W. & A.
Madagascar to Australia.

Wood very hard and heavy; dark-reddish. Used for piling and for fuel.

K. & V. 4:295–297; Van Eed. 126.

Bruguiera gymnorrhiza Lam. Plate XXVIII, fig. 84. Tumu (M.); potótan (Phil.).
East Africa to Australia.

The most stately tree of the mangroves. Wood very hard and very heavy, dark-reddish-brown. Construction and furniture in India; piling; fuel.

Ridl. 172; Watt Dict. 1:54; Gamb. 334; K. & V. 4:292–295; Van Eed. 127; Bargagli-Petrucci 75.

Bruguiera parviflora W. & A. Burrus; b'rus; b'eus (M.); lenggadi (Phil.).
India to Malaya and the Philippines; very abundant in the interior of mangrove swamps.

Hard and heavy. Growing usually to only a small size, but with a beautifully clear straight trunk. Wood less desirable than that of *Rhizophora* spp., or of *B. gymnorrhiza,* but still a good wood. Chief use, piling.

K. & V. 4:297; Van Eed. 127; Ridl. 172; Becc. 578.

Carallia integerrima DC. Plate XXVIII, fig. 83.
India and Ceylon to Malaya; fairly common in the Philippines, but usually not of large size.

Pretty, red-marked heartwood, used for construction, furniture, and fine cabinet work.

Watt Dict. 1:541; Gamb. 335, *tab. VII, fig. 3;* Nörd. X; K. & V. 4:301–304.

Ceriops roxburghiana Arn. Tengah; tengah puti (M.); tangal (Phil.).
Tropical tidal forests of the Old World.

Wood very hard and very heavy, orange-red in color and giving a fluorescent orange color to water in which it is placed. Very durable in water. Pith-rays distinct. The two species of this genus are distinctly the best of the mangroves, although they are of comparatively small

size. Used for piling, roof supports, etc., specially prized as a high-grade firewood.

K. & V. 4:287–289; Van Eed. 127.

Ceriops tagal (Perr.) C. B. Rob. (*C. candolleana* Arn.). Tangal (Phil.); tengah (M.).

Same distribution as the last.

Same kind of wood and same uses. Shipbuilding.

Watt Dict. 2:261; K. & V. 4:284–287; Van Eed. 127; Ridl. 172.

Gynotroches axillaris Bl. Mata keli; koekoeran (M.).

Malay Peninsula and Archipelago.

Wood soft, moderately heavy, not durable, light-brownish. Used for house work, rafters, blades of oars, etc.

K. & V. 4:306–213; Ridl. 173.

Kandelia rheedii W. & A. Tumu (M.).

British India to Formosa and Malaya.

Much less common than the preceding and but little used. Pith-rays said to be distinct from the rest of the wood because of a distinct yellow color.

K. & V. 4: 290.

Rhizophora conjugata L. Bakko, Akit (M.); Bacauan (Phil.).

Tidal forests of eastern Africa, Asia, and Australia.

Very hard and very heavy; like the next.

Ridl. 172; K. & V. 4:282; Van Eed. 128.

Rhizophora mucronata Lam. Plate XXIX, fig. 86. Belukap, b'lukap (M.); bacauan (Phil.).

Principal constituent of the mangrove on the Zanzibar coast (there called *mkonko*), then in the Seychelles, Madagascar, the whole of tropical Asia, through Malaya to Australia.

Much valued for construction work in regions of east Africa where timber is scarce. Piling, firewood.

Ridl. 172; Gamb. 335; Wiesner 2:123; K. & V. 4:278–282; Boulger 241; Van Eed. 128; Newton 6; Holtzapffel 93.

I can not distinguish the wood of *Rhizophora* spp. from that of *Bruguiera* spp.

COMBRETACEÆ.

KEY TO THE GENERA OF COMBRETACEÆ.

Pores more or less connected and surrounded by wood parenchyma.
- Pores medium-sized to small ..... *Anogeissus*
- Pores medium-sized to large ..... *Terminalia*

Pores not surrounded nor connected by wood parenchyma, small and in short radial lines ..... *Lumnitzera*

Anogeissus. Wood gray usually with a small purple-brown heartwood, hard, close-grained. Pores small, in light-colored patches sometimes arranged more or less concentrically (*A. latifolia* and *A. acuminata*), sometimes radially (*A. pendula*). Pith-rays fine, uniform, equidistant.

Anogeissus latifolia Wall.
British India.

Very hard and very heavy. Seasonal rings marked by lines without pores. Pores small, very numerous, often subdivided, surrounded either singly or in loose patches by wood parenchyma, the patches arranged obliquely or transversely in a roughly concentric fashion. Pith-rays very fine, extremely numerous, uniform, equidistant. Transverse diameter of the pores about equal to the distance between the pith-rays. Very strong and tough, but splits in seasoning and unless kept dry is not very durable. Ax handles, poles for carrying loads, axles of carts, furniture, agricultural implements, shipbuilding. Good fuel and excellent charcoal.

Gamb. 346, *tab. VII, fig. 4;* Nörd. X, also IX (*Conocarpus*); Watt Dict. 1:257.

Lumnitzera littorea (Jack) Voigt (*L. coccinea* W. & A.). Plate XXIX, fig. 87. "Red-flowered mangrove;" ñaña (Guam); culasi, ságasa, tabao (Phil.); taruntum, griting (M.); doekoek, doekoek-ageng (Jav.); taroengtoeng (Sumatra); api-api (Java and Sumatra).

British India and Ceylon to Australia and Polynesia; a mangrove swamp tree.

Wood hard and heavy, grayish- or yellowish-brown, occasionally with a certain reddish tinge. Fine-grained, with faint rose-like odor when first cut. Irregular seasonal rings said to be sometimes present. Pores small, in short radial lines. Pith-rays fine, numerous, the distance between them about equal to the diameter of the pores. Wood strong and durable. Used for piling, with the bark on. In Borneo, this wood is considered as second only to *billian* for piling, and much of it is exported for that purpose. On the Malay Peninsula it is used for the axles of carts. Used for boat building by the natives of Kaiser Wilhelmsland. Not much used in the Philippines, although it is very widely distributed.

Ridl. 173; Van Eed. 129; Safford 385; Becc. 578; Bargagli-Petrucci 77, *tab. XIV;* K. & V. 9:31–33.

Lumnitzera racemosa Willd. Kripa (Beng.); yinye (Burm.).

Tropical east Africa, Madagascar, Ceylon, British India, Burma, Java, New Guinea, Australia, Polynesia, Philippines, and Formosa.

This is a much smaller and less important tree than the last, but it is said to be very important as a firewood in some sections. The wood is strong and durable and is sometimes used for house posts.

Gamb. 348; K. & V. 9:33; Watt Dict. 5:97.

Terminalia. The woods of the *Pentaptera* and *Chuncoa* sections are dark-colored, rather like, but darker and rougher than walnut; those of the *Catappa* section are lighter in color, but have occasionally an irregular dark heartwood. In the former class the pores are larger and the texture rather more open, but in this respect *T. belerica* comes between the two. In all, the pores are in patches or single, and these patches are more or less concentrically confluent, and in all the pith-rays are fine, numerous, and uniform. The wood of *T. oliveri* resembles that of *T. chebula* in the *Catappa* section, but has smaller pores.

SUBGENUS 1, CATAPPA.

Terminalia catappa L. "The Indian almond;" "Malabar almond;" talisai (Guam); talisay, dalisai (Phil.); talie (Samoa); kaorika, kauarika (Raratonga); tavola (Fiji); kamani (Hawaii); almendro (Spanish America); badamier (French); saori (Solomon Islands); tipop, tipapop (Ponape, Caroline Islands); badam (Beng.); kottamba (Cing.); katapang (Malay).

Madagascar, British India and Ceylon, Malay Peninsula and Archipelago to New Guinea and Polynesia; cultivated in all the tropics.

Wood red, with lighter-colored sapwood, hard. Pores moderate-sized, scanty, joined by wavy, short, concentric bands of wood parenchyma. Pith-rays fine. Troughs, carts, posts, planks, etc.

Gamb. 337; Safford 385; Watt Dict. **6**:22; Phil. Woods 393; Ridl. 173; K. & V. **9**:27; Van Eed. 129.

Terminalia belerica Roxb. Behara (Hind.); bohera (Beng.); tani (Tam.); búlú (Cing.); thitsein (Burm.).

British India, Ceylon, Burma, Malacca.

Wood yellowish-gray, hard, no heartwood, not durable, readily attacked by insects; seasonal rings indistinct. Pores very scanty, large, frequently divided, joined by irregular, wavy, concentric bands of wood parenchyma. Fine, uniform and equidistant pith-rays distinctly visible in the darker and harder portions between the bands, and on radial section, where, too, the pores are prominent. Planking, packing-cases, canoes, and in northwest India for house building after it has been steeped in water, which renders it more durable.

Gamb. 337, *tab. VIII, fig. 5;* Nörd. VIII; Watt Dict. **6**[1]:22; Van Eed. 129; K. & V. **9**:17–20.

Terminalia chebula Retz. Harra (Hind.).

British India and Ceylon to Malaya.

Wood very hard, brownish-gray with a greenish or yellowish tinge, with an irregular small dark-purple heartwood, close-grained, fairly durable. Seasonal rings indistinct. Pores small and moderate-sized, often subdivided, singly or in groups surrounded by small patches of wood parenchyma which are slightly confluent into more or less concentrically arranged bands. Pith-rays very fine, uniform, equidistant,

numerous, stopping at or bent round the pores or groups of pores. The wood takes a good polish and is fairly durable; it is used for furniture, carts, agricultural implements, and house building. Beddome says it is cross-grained and difficult to work.

Gamb. 338–340, *tab. VII, fig. 6;* Nörd. VIII; Watt Dict. 6[4]:24.

Terminalia citrina Roxb., and *T. angustifolia* Roxb., of this section are two Indian species of local importance.

SUBGENUS 2, PENTAPTERA.

Terminalia arunja Bedd. Arjún (Beng.).
Western India and Ceylon.

Sapwood reddish-white; heartwood with darker-colored streaks, very hard and heavy. Seasonal rings doubtful. Pores moderate-sized and large, sometimes very large, uniformly distributed, more numerous and larger than in *T. tomentosa,* often subdivided into 2 to 4 compartments, each pore surrounded by a ring of wood parenchyma. Numerous, thin, wavy, concentric lines, which frequently anastomose. Pith-rays very fine and numerous. Wood apt to split in seasoning and not easy to work. Used for carts, agricultural implements, boats, and for building purposes.

Gamb. 341; Van Eed. 126; Nörd. IX (*T. macrocarpa* Steud.).

Terminalia oliveri Brandis. Than (Burm.).
Burma.

Wood hard, close- and even-grained, resembling that of *T. chebula;* sapwood yellow to gray; heartwood purplish-brown, streaked and clouded, very irregular. Pores small or very small, numerous, often subdivided, singly or in groups surrounded by patches of loose tissue which run into more or less concentrically arranged bands. Pith-rays fine and very fine, numerous, regular.

Gamb. 340.

Terminalia tomentosa W. & A.
India, Ceylon.

Sapwood reddish-white; heartwood dark-brown, hard, beautifully variegated with streaks of darker color, showing on a radial section as dark streaks which are generally undulating. Pores moderate-sized and large, uniformly distributed, each pore inclosed in an irregularly shaped and generally elongated patch of wood parenchyma; these patches are often arranged in concentric lines and frequently joined by thin, wavy, concentric bands. Pith-rays not distinct, very fine, numerous, uniform, equidistant, often wavy, the transverse diameter of the pores many times larger than the distance between the rays. House building, carts, rice-pounders, ship and boat building, railroad ties.

Gamb. 341–344; Nörd. VIII; Watt Dict. 6[4]:37–41.

SUBGENUS 3, CHUNCOA.

Terminalia paniculata W. & A.
Western British India.

Wood gray, with darker heartwood, very hard. Pores large and moderate-sized, oval, often subdivided, numerous, surrounded by faintly marked patches of wood parenchyma, arranged in oblique and wavy lines and connected into somewhat concentric bands. Pith-rays fine, uniform, wavy, numerous; the distance between them usually less than the diameter of the pores. Structural work.

Gamb. 344.

SUBGENUS 4, BIALATA.

Terminalia bialata Wall.
Burma and the Andaman Islands.

Wood gray and beautifully mottled, moderately hard and heavy. Structure and uses the same as in *T. belerica.*

Gamb. 345; K. & V. 9:28–30.

PHILIPPINE SPECIES OF TERMINALIA.

Thus far the Philippine species of *Terminalia* have not been sufficiently understood to make it possible to work out their structure with anything like completeness. Most of our Philippine species belong to the section *Catappa.* Our species in this section are *T. catappa* L., *T. pellucida* Presl, *T. nitens* Presl, *T. edulis* Blanco, *T. ellipsoidea* Merr., and *T. mollis* Rolfe; in the section *Diptera* we have *T. calamansanay* Rolfe.

Some of these woods are known under the names of *Talisay* (Phil. Woods 393), *calumpit* (Phil. Woods 380), *dalinsi* (Phil. Woods 381), and *sacat,* Plate XXIX, fig. 88, (Gard. 58; Phil. Woods 392). Until the specific limits are better known, it will be difficult to do anything with the structure of these woods.

Besides these, there is a *Terminalia* furnishing a very good wood known as *bingas, dinglas,* or *lasila* (*Terminalia comintana* (Blco.) Merr.). This wood is dark-gray with purple markings. It is hard and moderately heavy, durable, works readily and is used for structural work and for furniture. It is sometimes sold under the name of *batitinan,* and it is so fine grained that it is sometimes used as a substitute for *molave* (*Vitex littoralis* Dcne.).

MYRTACEÆ.

Pores small to moderate-sized, often arranged in more or less conspicuous concentric belts, or else in short strings. Pith-rays fine and numerous.

Eucalyptus. This very large genus is mainly confined to Australia, but it produces such quantities of wood and it is so extensively handled that it is a prominent factor in all eastern markets. Certain species have

been rather extensively planted in India and elsewhere. A few of the best known species are here considered.

Wiesner **2**:976–982 includes the following characterization.

Wood in cross section with numerous, prominent, light-colored spots, which contain small vessels and which frequently or always are arranged in obliquely placed stripes of changeable direction, arranged in concentric zones and so forming an appearance more or less suggesting annual rings. Sometimes there are seen on the cross-section cavities in which there is a dark-reddish-brown mass. Wood hard, heavy, usually splitting easily but roughly, checking and warping badly, but tough, elastic, strong and durable. The *Eucalyptus* woods are divided into two groups on the ground of color. The one light-brown, having about the appearance of ordinary oak wood, from which, however, it differs very markedly by the irregular appearance of the cross-section and the absence of broad pith-rays; the others appear dull-red to fleshy-red, about the tint of red *Casuarina* wood or of horseflesh wood, with which woods, however, they are not to be confused. Both sorts of *Eucalyptus* woods have the same structure.

LIGHT-BROWN EUCALYPTUS WOODS.

Distinct from the reddish-colored species by the scanty development of wood parenchyma and by the contents of the wood parenchyma and pith-ray cells. Both of these elements contain in many cells light-brown or yellowish-brown coloring material which is quickly or slowly blackened by iron chloride, partially soluble in water, which it colors, blackened by quicklime.

Eucalyptus globulus Labill. The blue gum.
Victoria and Tasmania; naturalized in British India and Ceylon.

Wood gray with darker streaks and moderately hard. Very heavy. Pores small to moderate-sized, round, in groups or in radial or oblique lines; closely packed in concentric belts in the annual rings. Pith-rays fine, very numerous, the intervals between the rays smaller than the diameter of the pores. Pores marked on a longitudinal section. House beams, railway sleepers, bridge-work, charcoal.

Stone 125; Gamb. 353. *tab. VIII, fig. 1;* Nörd. VI; Hough's American Woods, **8**:183; Van Eed. 133.

Eucalyptus maculata Hook. "Spotted gum," in Queensland and New South Wales.

Eucalyptus microcorys F. v. Muell. "Tallowwood," same range.

Eucalyptus obliqua L'Her. "Stringybark," in Tasmania, New South Wales and southern Australia. In Australia, the shaggy-barked species are usually called "stringy bark trees," while the smooth-barked species are called "iron bark trees."

Eucalyptus pilularis Smith. "Blackbutt," in Tasmania, New South Wales and Queensland.

Stone 124.

RED EUCALYPTUS WOODS.

In addition to the points already mentioned, the red *Eucalyptus* woods frequently have two- or three-layered pith-rays. The yellowish crystalline substance in the cells seems to be sometimes only sparingly present. Calcium oxalate seems to be wanting. Chips coloring alcohol or water, the latter more darkly red, without the content of the cells being noticeably dissolved; it remains unchanged in boiling water and is only dissolved when quicklime is added. The unchanged contents of the cells deeply blackened by iron chloride.

Of *Eucalyptus* species with red wood, the following are to be placed here:

Eucalyptus crebra F. v. Mueller. Ironbark in New South Wales, Queensland and north Australia.

Eucalyptus marginata Sm. The jarrah or bastard mahogany.
West Australia; cultivated in British India.

Wood hard, sapwood white, heartwood red. Pores small, scanty, scattered unevenly, but chiefly in pale concentric bands. Pith-rays very fine, very numerous. Heavy construction work, piling.

Gamb. 353; Van Eed. 133; Stone 114; Stevenson 250–254.

Eucalyptus rostrata Schl. Red gum, West Australia.

Eucalyptus resinifera Smith. Forest-mahogany, West Australia.
Stone 115.

Very many other species are used, but those mentioned are said to be the ones most commonly exported. Many of these woods seem to have proved quite durable for street paving in temperate regions.

Eugenia. Plate XXIX, fig. 89. Wood rough, moderately hard to very hard, seasons well, usually reddish- or grayish-brown. Pores small to moderate-sized, more or less arranged in concentric bands, sometimes joined by pale tissue of large wood cells. Pith-rays fine, numerous. A very large number of species, which are very difficult to distinguish. The timbers are usually good, and some are exceptionally so, and can be used for house or ship building. In the Philippines, woods of this genus are known as *macaasin* or *malaruhat*. In the Federated Malay States, they are known as *kayu klat*. Some very fine and some rather indifferent woods belong to the genus; but, as yet, I have not been able to properly classify them. Many of the species of *Eugenia* are of very scattered occurrence and do not grow to unusual size, consequently they are not a very considerable factor in the market.

Ridl. 175–178; Phil. Woods 387; Newton 5; Gard. 61.

Eugenia caryophyllaea Wight.

Van Eed. 134; Gamb. 359; Nörd. VII (*Myrtus caryophyllata* L.); K. & V. 6:101–104.

Eugenia jambolana Lam. Jaman (Hind.).

Van Eed. 135; Gamb. 361, *tab. VIII, fig. 2;* Nörd. VII; K. & V. 6:132–136.

Eugenia jambos L.
Van Eed. 135; Gamb. 357; Nörd. V (*Myrtus jambosa*); K. & V. 6:53–55.

Eugenia operculata Roxb.
Van Eed. 137; Gamb. 360; Nörd. IX; K. & V. 6:148–152.

Eugenia wallichii Wight.
Gamb. 357; Nörd. IX.

Sudjung.—There is found in the Island of Mindanao a very hard wood of this name which is probably produced by some species of *Eugenia*. The wood is dark-brown in color, contains a considerable amount of oil and is very durable. It is often used for corner posts of houses.

Leptospermum flavescens Sm. (*Leptospermum amboinense* Reinw.)
Sunda and Molucca Islands, Australia, Malay Peninsula.

Very hard wood used for tool handles.

Van Eed. 138; E.-Pr. 3[7]:94.

Melaleuca leucadendron L. "Cajeput tree."
British India, Malay Peninsula and Archipelago, and Australia.

Reddish-brown, hard. Pores moderate-sized, scanty, producing wavy lines on a vertical section. Pith-rays fine, extremely numerous. Piling.

Van Eed. 138; Gamb. 351; Ridl. 174; K. & V. 6:180–183; Stone 132–134.

Metrosideros (*Nania*). Very hard and very heavy wood. Pores and pith-rays very small, hard to distinguish with a lens. Dark-purplish-brown.

Metrosideros vera Lindl. (*Nania vera* Miq.) Eijserhout; kajoe besi; nani (M.).
Java, Amboina, Ternate, the Moluccas.

Very hard and very heavy; dark-reddish-brown; durable; very difficult to work. Resists the teredo. House and bridge building.

Van Eed. 139; K. & V. 6:168–171.
Other species of the genus in Australia and New Zealand are also noted for fine grain, hardness and durability.

Psidium guajava L.
Cultivated throughout the tropics.

Wood grayish-brown, moderately hard, even-grained. Pores small, numerous, in short radial groups. Pith-rays fine, short, numerous, indistinct. Engraving, spear handles, charcoal, firewood.

Van Eed. 139; Gamb. 355; Ridl. 175; Nörd. V (*Psidium pyriferum*); K. & V. 6:35.

Rhodamnia trinervia Blume. (*Rhodamnia cinerea* Jack.) Mempayan (M.).
British India, through Malaya, to Australia.

Wood brown, moderately hard, with faint irregular but more or less concentric very narrow lines of loose texture. Pores small to moderate-sized, irregularly distributed, occasionally in somewhat concentric lines.

Pith-rays few, moderately broad to broad, with many very fine between them. Beams for house building and plow handles.

Van Eed. 139; Gamb. 355; Nörd. IV (*Myrtus trinervia* Sm.), VII (*Myrtus melastomoides* F. M.); Ridl. 174.

Tristania. Wood hard to very hard and heavy to very heavy; durable. Reddish or dark-reddish; close-grained. Pores small; pith-rays small. Wood parenchyma scanty.

Tristania burmannica Griff.
British India and Malaya.
Gamb. 354.

Tristania decorticata Merr. Malabayabas.
Philippines, Sarawak.

Wood hard and heavy, fine-grained; dark-reddish-brown; used for tool handles.

Tristania merguensis Griff.
Straits Settlements.
Ridl. 175.

Tristania obovata Benn. Palawan, prawan.
Banka, Sumatra, Borneo.

Very fine firewood. Used for the tin and gold mines.

Van Eed. 140; Bargagli-Petrucci 78, *tab. XV.*

Tristania whitiana Griff.
Singapore.
Ridl. 175.

Various species of *Tristania* are known in Borneo by the name of *Plawan* and the wood is used for firewood; Becc. 578, 585.

Xanthostemon verdugonianus Naves. Plate XXIX, fig. 90. Mancono (Phil.)

Philippines; Surigao, Leyte, Palawan, Camarines.

Very hard and very heavy. Probably the hardest and heaviest of Philippine woods. Exceedingly durable. A possible substitute for *lignum-vitæ.*

Phil. Woods 388; Hutchinson, For. Bur. (Philip.) Bull. 9 (1908).

MELASTOMATACEÆ.

Wood heavy, hard, fine-grained. Usually light-colored. Pores and pith-rays fine to very fine.

Astronia papetaria Blume.
Malay Archipelago.

Good structural wood.

Van Eed. 144.

Melastoma malabathricum L. Sendukduk.
British India, Burma, and Ceylon.
Gamb. 366; Ridl. 178.

Memecylon. Wood very hard, close-grained, brown or whitish. Pores small, in irregular groups. Pith-rays many, extremely fine to fine.

Memecylon edule Roxb. Nipis kulit; "ironwood tree."
India, Ceylon, Malaya.

Valuable hard durable wood, which is one of the best substitutes for boxwood. (See p. 426.)

Gamb. 368; Watt Dict. 5:226; Ridl. 178; K. & V. 5:210; Becc. 579.

Pternandra caerulescens Jack.
British India, Burma, Straits Settlements.

Wood light and soft.

Gamb. 368; Ridl. 178.

ARALIACEÆ.

Wood white, usually soft. Pores small, usually rather scanty; a line of larger pores often indicating the seasonal rings. Pith-rays moderately broad, not numerous, giving a silver-grain.

Aralidium pinnatifidum Miq. Alus surat.
Straits Settlements.

Wood faint-dull-red, hard, splits deeply in drying. Upright supports of bridges and heavy work of a similar description.

Ridl. 180; Gamb. 384.

Polyscias nodosa Seem. Plate XXIX, fig. 91. Malapapaya.
Philippines and Malay Archipelago.

Matchwood; the best wood for this purpose in the Philippines.

Phil. Woods 387; K. & V. 7:11–13; Van Eed. 151.

CORNACEÆ.

Pores usually small and in short radial lines, and the pith-rays fine and numerous.

Alangium lamarckii Thw.
East Indies.

Hard, close-, and even-grained, sapwood light-yellow, heartwood olive-brown, with a pleasant scent. Pores small, scanty, in short radial lines of 2 to 5. Pith-rays fine, closely packed, wavy, bent round the pores, the diameter of which is slightly greater than the distance between the rays.

Watt Dict. 1:155; Gamb. 389.

Marlea begoniaefolia Roxb.
British India, Java, Philippines.

Wood white, soft, even-grained. Seasonal rings marked by a belt of numerous pores. Pores moderate-sized and large, small in the outer portion of each ring. Pith-rays short, wavy, fine and moderately broad. Structural work.

Gamb. 389; K. & V. 5:82–84.

Marlea ebenacea C. B. Clarke. Lidah kerbau putih.
Straits Settlements.

Wood hard, strong, and durable, yellow with a red heart.

Ridl. 180.

Marlea nobilis C. B. Clarke. Sutubal.
Straits Settlements.

Hard and durable; structural work.

Ridl. 180.

Mastixia arborea C. B. Clarke.
British India and Ceylon.

Wood greenish-gray, soft. Pores small, numerous, evenly distributed. Pith-rays fine and very fine, numerous and short. Seasonal rings indistinct.

Gamb. 391.

MYRSINACEÆ.

Wood compact, close-grained. Pores very small or extremely small, often in groups or in radial or oblique lines. Pith-rays distant, fine to broad, more often broad. Resin-ducts frequent, sometimes among the wood cells, sometimes in the rays.

Aegiceras corniculatum (L.) Blanco (*Aegiceras majus* Gaertn.). Tinductinducan (Phil.); truntum (M.).
A constituent of the mangrove swamp, Ceylon to the Philippines and Australia.

Wood reddish or dark-brown, often streaked with yellow, moderately hard, even-grained. Pores very small, scanty, uniformly distributed. Pith-rays moderately broad to broad, short, scanty, dark, yellow in spots. Very oily; used in structural work and for firewood.

Gamb. 442; Ridl. 212; Van Eed. 161; K. & V. 5:276–278.

Aegiceras floridum Roem. & Schult. Plate XXIX, fig. 92.
Philippines, Amboina, New Guinea.

Very much like the preceding.

Ardisia. Wood moderately hard. Pores small, usually in radial lines. Pith-rays broad.

Ardisia paniculata Roxb.
British India.

Wood pinkish-white, moderately hard. Pores small, in radial lines. Pith-rays short, broad, wavy.

Gamb. 441.

Maesa. Wood light-brown, soft. Pores small, scanty, sometimes in short radial lines, often filled with resin. Pith-rays usually fine, numerous.

Maesa indica (Roxb.) Wall.
British India and Ceylon.

Brownish-white wood, used for posts.

Gamb. 438; K. & V. 5:222–224.

Maesa rugosa Clarke.
British India and Java.
Gamb. 437.

Myrsine africana L.
British India and South Africa.

Wood light-brown, moderately hard. Pores extremely small, scattered or in short radial lines, between the distant, moderately broad pith-rays, which contain many resin-cells.

Gamb. 438; Nörd. V (*M. retusa* Ait.).

SAPOTACEÆ.

The wood of the *Sapotaceæ* has a well-marked character, somewhat difficult to describe accurately, but easily recognized when understood, as it resembles that of no other family except *Ebenaceæ,* where the woods are usually black or gray, while those of *Sapotaceæ* are usually red. Wood hard, smooth, durable; heartwood dark-colored, generally red. Pores small and moderate-sized, in wavy, radial lines, which are frequently oblique, the lines being more or less in echelon. Pith-rays numerous, fine, equidistant, joined by fine, transverse bars or concentric lines of loose texture.

Bassia. Wood hard, smooth, durable, usually with red heartwood. Pores small and moderate-sized, in short radial or oblique lines, more or less in echelon. Pith-rays numerous, fine, equidistant, joined by fine transverse bars.

Bassia latifolia Roxb.
British India and Burma.

Wood hard to very hard; sapwood large; heartwood reddish-brown. Seasonal rings indistinct. House building, furniture and country vessels, naves of wheels.

Gamb. 447, *tab. IX, fig. 4;* Nörd. X.

Chrysophyllum roxburghii G. Don. "Star apple."
British India, Java, Sumatra and Philippines.

Wood white, close-grained, moderately hard. Pores in small radial lines bending into oblique strings. Pith-rays numerous, very fine. Shingles.

Gamb. 443; Ridl. 212; K. & V. 1:130; Lewis 309.

Illipe. Wood soft to very hard and light to very heavy. Wood of some species very durable. Reddish. At any rate the harder woods with a considerable amount of saponin in the wood, lathering when wet.

Illipe latifolia (Roxb.) Engler. (*Bassia latifolia* Roxb.) "Butter tree;" "mahua tree."
British India.

Wood hard with red heart.

Watt Dict. 1:445.

Illipe malabrorum König. (*Bassia longifolia* L.) Mowa tree; mahua tree.
Ceylon, Malabar.

Reddish, moderately hard. Structural work and shipbuilding.

Watt Dict. 1:416; E.-Pr. 4¹:134.

Illipe betis (Blco.) Merr. Plate XXIX, fig. 93. Betis.
Philippines.

Piling and heavy construction, very durable.

Phil. Woods 377; Gard. 63.

Isonandra perrottetiana Wight.

Wood light-reddish-brown, hard, close-grained. Pores small to moderate-sized, in narrow groups which are somewhat radially but obliquely arranged, and often fork. Pith-rays fine, regular. Transverse lines clear and conspicuous, regular and wavy. Structural and finishing work.

Gamb. 445.

Mimusops. Wood red, very hard. Pores small, in short radial or oblique lines. Pith-rays very fine, very numerous, uniform and equidistant. Numerous wavy, concentric lines.

Mimusops elengi L. Poko Tanjong; tandjoeng; ki-tandjoeng; boengo-tandjoeng (M.); bansalaguin (Phil.).
British India and Ceylon and throughout the Malayan region.

Widely cultivated in the tropics. Wood very hard and very heavy; close- and even-grained; sapwood reddish-brown; heartwood dark-red. Strong, durable. Piling and heavy construction work, tool handles.

Gamb. 449; Ridl. 213; Van Eed. 164; Watt Dict. 5:251; Phil. Woods 375; Gard. 64.

Mimusops kauki L. San, saoe (M.); "ironwood."
Malay Peninsula, Java, Celebes.

Much like the preceding and used for the same things.

K. & V. 1:156–158; Van Eed. 164; Ridl. 214.

Mimusops littoralis Kurz. "Andaman bullet wood."
Andaman and Nicobar Islands.

Very hard and very heavy; reddish-brown to pinkish-brown; durable. Structural work.

Gamb. 451; Watt Dict. 5:253; E.-Pr. 4¹:152.

Palaquium. Plate XXIX, fig. 94. Reddish, moderately hard and heavy to very hard and heavy. Pores moderate-sized, in radial echeloned strings. Pith-rays fine, numerous. Transverse concentric lines numerous, wavy. Wood with or without saponin.

Palaquium barnesii Merr. Nato.
Philippines.

Soft or moderately hard and moderately heavy. Light planking and temporary construction work.

Phil. Woods 391.

Palaquium borneense Burck. Njatoe-doerian.
Borneo.
Van Eed. 164.

Palaquium javense Burck. Njatoh; njatoe; kawang; djempina; grawang.
Java.

Furniture and structural work.

Van Eed. 165; K. & V. 1:143–145.

Palaquium sp. Nyatto pisang.
Sarawak.

Very hard and durable. Boats.

Palaquium obovatum Engl. Belian wangi. Betis.

Timber very dull-reddish, grain medium, very hard and very heavy; splits slightly in drying; affords beams of excellent quality, which remain undecayed a long time under water and are not badly eaten by termites. Pith-rays fine, rings distinct and irregular with very fine concentric rings numerous and wavy. Pores moderate in short rows parallel with the rays, often subdivided, not very numerous.

Ridl. 213; also in Agric. Bull. F. M. S. & S. S. (1906) 39; (1907) 171.

Palaquium polyanthum Engl.
British India.

Wood red, hard. Pores moderate-sized, in wavy radial lines, sometimes slightly oblique. Pith-rays fine, not prominent. Fine wavy, parallel and equidistant concentric lines. Planks, tool handles, etc.

Gamb. 446; Nörd. X.

Palaquium bancanum Burck.
Malay Peninsula.

Wood reddish-brown, rays fine and close, pores moderate, in radial rows; rings fairly distinct, fiber wavy. A light wood with a good gloss.

Ridl. 213.

Numerous other species of *Palaquium* are used, most of them of not very good quality.

The name *nato,* with its variants, is applied to this genus and its close relatives, gutta-percha bearing plants, all the way from Madagascar to the Pacific. In the Malay Peninsula the equivalent term is *taban* and in Sumatra *balam.*

Becc. 579.

Payena leerii Kurz. Gutah-sundik; njatoe-balam-bringin; balam-tandjong; poeting; getah-seundik (M.).
Malay Peninsula, Borneo, Sumatra, Banka, Riouw.

Wood used for house building.

Van Eed. 165; Ridl. 213.

Payena lucida A. DC. Niato balam.
British India and Malay Peninsula.

Wood red, hard. Pores moderate-sized, in short radial lines. Pith-rays very fine, very numerous, uniform, equidistant. Numerous parallel, wavy, concentric lines, not very prominent. Planking.

Gamb. 449; Ridl. 213.

Sarcosperma arboreum Benth.
British India.

Wood pink, moderately hard. Pores moderate-sized, in long, wavy, radial lines. Pith-rays numerous, fine, equidistant, the distance between two rays much less than the diameter of the pores. Indistinct concentric lines. Used in making canoes.

Gamb. 443.

Sideroxylon ferrugineum Hook. Tuak-tuak.
Malay Peninsula.

Wood hard and heavy, pinkish-brown in color, with very fine rays, and wavy concentric lines, the pores arranged in wavy lines radiating from the center, whiter than the ground color and giving the wood a pleasing mottled appearance.

Ridl. 212; Van Eed. 165.

Sideroxylon tomentosum Roxb.
British India, Burma, and Ceylon.

Wood light-yellowish-brown, moderately hard (plains specimens) to hard (hills specimens). Pores fine (hills) to moderate-sized (plains), in groups in short lines, usually oblique, the groups somewhat far apart and in echelon. Pith-rays very fine, very numerous, equidistant. Very numerous, very faint lines across the rays, irregular. Structural work.

Gamb. 444.

Many other species of *Sideroxylon* are used locally, but they do not commonly occur in much quantity and so are not of much importance commercially.

Bedaru, Daru, or *Daroo-daroo.* This wood has been credited to this family at various times. Ridley (214) says that it is evidently sapotaceous. King and Gamble in their materials for a Flora of the Malay Peninsula,[2] under the description of *Sideroxylon malaccense* Clarke, make the following statement: "Mr. Cantley (the collector) says that this tree gives the true 'daru-daru' wood of the Malay Peninsula."

The wood now known as *bedaru* or *daru* in Sarawak and Singapore is distinctly not sapotaceous in structure. (See p. 492.) I have collected herbarium material and wood from the same tree in Sarawak and have compared the wood with the material sold under that name by the timber dealers at Singapore and have found the two to be identical. It is a species of *Urandra* (*Icacinaceae*).

[2] Journ. As. Soc. Beng. 74²:162.

EBENACEÆ.

This family is important because it produces the ebony of commerce. The sap and heartwood are often very distinct; sapwood white, yellow, pink or reddish or gray; heartwood black or black-streaked, sometimes with a greenish tinge. Wood hard to very hard and heavy to very heavy. Pores small to moderate-sized, scanty, often in short radial lines which are distant and somewhat in echelon, each pore surrounded by a collar of wood parenchyma one cell thick. Wood parenchyma in fine, more or less regular, sometimes indistinct, parallel concentric lines. The *Sapotaceæ* are distinguished from the *Ebenaceæ* by having usually red or yellow wood, longer radial lines of pores which have a more conspicuously oblique arrangement. Also the *Sapotaceæ* do not have the collar of wood parenchyma about the pores.

The different members of the family have such uniform structure that it seems impossible to distinguish the different genera and species structurally.

Any member of the family may furnish ebony, if the heartwood is sufficiently developed. Many species do furnish ebony, but most of them are of small size and so relatively unimportant. The true black heartwood seems to be somewhat irregular in occurrence. Occasionally a tree of good size seems to lack it entirely. In many cases, old injuries are found to be bordered by a small amount of the black heartwood. The following statements by Hiern[3] show which are the best known commercial species and their region of occurrence.

The following species supply ebony:

Diospyros ebenum König. India, etc.
D. melanoxylon Roxb. India.
D. dendo Welw. Angola, west tropical Africa.
D. sylvatica Roxb. India, etc.
D. gardneri Thw. Ceylon.
D. hirsuta L. f. Ceylon.
D. discolor Willd. Malaya, etc.
D. embryopteris Pers. India, etc.
D. ebenaster Retz. Malaya, etc.
D. montana Roxb. India, etc.
D. insignis Thw. Ceylon and southern India.
D. tupru Ham. India.
D. mespiliformis Hochst. Tropical Africa.
D. truncata Zoll. & Mor. Java.
D. tessellaria Poir. Mauritius.
D. haplostylis Boiv. Madagascar.
D. microrhombus. Madagascar.
D. ramiflora Wall. Northeast India.
Maba buxifolia Pers. India, Madagascar, etc.
M. mulala Welw. Angola, west tropical Africa.
Euclea pseudebenus E. Mey. South Africa.

[3] Hiern, Ebenaceae 29.

The following species also produce good wood:

Diospyros malacapai A. DC. Wood yellow with black spots. Philippines.
D. pilosanthera Blanco. Ornamental wood.
D. pilosa A. DC. Timber fit for building purposes. Cochin China.
D. chloroxylon Roxb. Wood pale. Circars, India.
D. foliosa Wall. Valuable light-colored wood. Southern India.
D. lanceaefolia Roxb. Hard and handsome wood. East Indies.

Calamander or Coromandel wood, a finely variegated and scarce wood, is produced by *D. quaesita* Thw. and by *D. oppositifolia* Thw.

Anchors for large boats are made, in the Province of Tavoy in Burmah, of the wood of *Maba buxifolia* Pers.

Those species which produce a mottled or streaked wood are really much more beautiful than the dead black ebony, but this latter is usually more in demand.

Artificial ebony.—Local dealers often use various artificial means to produce an even black color. European dealers sometimes dye pieces of box or pear wood and sell them for ebony. The fine, even grain of these woods makes them well suited for this purpose. They are usually lighter in weight than the true ebony and the color given them is usually only superficial.

In the Philippines, it is said that *camagon, bolongeta* and other native ebonies, which are only streaked with the black heartwood may be colored uniformly black by being buried for some months in the salt mud of the mangrove swamp. I can not vouch for the correctness of this statement, but it sounds reasonable. I think that the method indicated or the application of certain chemicals may be successfully used to produce a good even black heartwood. This would, in reality, be merely a hastening of the normal process of heartwood formation and it should produce a very good ebony. Experiments are in progress to determine the feasibility of this scheme.

Uses of ebony.—Ebony is employed to make pianoforte keys, the stringholder in violins, spear-points, fine furniture and cabinet work, canes, inlaying; and the best kind of ebony is very valuable on account of its maintaining a permanent shape and not warping, and is therefore used for rules and measures. This freedom from shrinking and warping is probably due to the fact that the wood is very fine-grained and all the elements of the wood are filled up with a homogeneous substance which is probably some combination of an iron salt with a tannic acid.

CLASSIFICATION OF PHILIPPINE EBONIES.

Philippine ebonies are black, streaked or dull-grayish in color.

Black ebonies.—These have heartwood of a uniform dead black. They are known as *ebano* or *ala-ala*. *Ebano* is usually produced by *Maba buxifolia* Pers. The sapwood is white and the heartwood very sharply marked off from it. This is a very satisfactory ebony, but it is of

rather local occurrence and is usually of small size. It seems to furnish the best of the ebony canes sold in Manila.

Ata-ata.—This is the name given to *Diospyros* spp. which have a white or streaked sapwood and a dead black heart. The sapwood and heartwood are not here so sharply separated as in *Maba buxifolia* and the relative amount of heartwood is less; *ata-ata* seems to be of fairly common occurrence from southern Luzon southward. It usually forms considerably larger trees than does *Maba buxifolia*.

Streaked ebonies.—These are the most beautiful woods of the group. They are known as *bolongeta* and *camagon*.

Bolongeta.—This is produced by *Diospyros pilosanthera* Blanco, and, probably, other species. The sapwood is pink or reddish and the heartwood black with brownish or reddish streaks. This is a large tree of frequent occurrence and wide distribution in the Archipelago. It is used for various articles of furniture and for structural work. It is sometimes used for piling, but is said to be very subject to teredo attack. If an artificial seasoning method can be devised, this will be a very prominent source of commercial ebony.

Camagon.—This seems to be mainly the product of *Diospyros discolor* Willd. Next to *bolongeta*, it is the most commonly seen of our ebonies. It is cultivated for its fruit, which is known as *mabolo*. The sapwood is gray-mottled to purplish-gray with black spots; the heartwood is black with brownish streaks. It is not to be distinguished in appearance from the Calamander wood of Ceylon. It is commonly used for fancy furniture and for canes.

Of the other ebonies, *Diospyros nitida* Merr. may be mentioned for its uniform dull bluish-gray wood, much like the sapwood of *camagon*. Apparently this species does not form a distinct heartwood. It is of small size and relatively infrequent occurrence.

Other forms of ebony may occur in the Islands, but they are certainly not of commercial importance. The so-called "white ebony," *Diospyros malacapai* A. DC., is not well known. It may be nothing but sapwood of *ata-ata* or other ebonies.

I believe that any of the above-described ebonies may, at times, produce the dense black form.

Ebonies in Malaya.—*Kayu arang* is the name applied to those ebonies of the Malay region which produce a distinct black heartwood.

In Borneo, various species of *Diospyros* which do not have distinct black heartwood are known as *kayu malam* or *mar pinang*.

Some very fine large ebony logs are produced in the Moluccas and in Sumatra. Borneo does not seem to produce very much.

Indian ebonies.—Gamble classifies the Indian ebonies as follows:

(1) Heartwood wholly black or only slightly streaked: *ebenum, tomentosa, melanoxylon, assimilis.*

(2) Heartwood regularly streaked black and brown or gray: *kurzii, quaesita, oocarpa, thwaitesii, gardneri, insignis, oppositifolia, undulata.*

(3) Heartwood very small, merely black streaks in the brownish-gray or gray wood: *embryopteris, foliolosa, sylvatica, ehretioides, microphylla, humilis, ovalifolia, kaki, tupru.*

(4) Heartwood none, wood red, white, gray, or yellowish: *martabanica, montana, toposia, foliolosa, lotus, chloroxylon, oppositifolia, candolleana, nilagirica, crumenata, pyrrhocarpa.*

Ceylon ebonies.—The ebonies, perhaps, reach their highest development on the Island of Ceylon. They have been carefully studied and H. Wright's "The Genus Diospyros in Ceylon; its Morphology, Anatomy and Taxonomy" [4] is much the most complete work of its sort.

Diospyros ebenum König. Itam (M.); ebbenhout; ebony.
Ceylon, south India, Sumatra, Malacca, the Moluccas, Celebes.

This is the best-known ebony tree. There is very little of it cut in India, the trees not being very common, and being found only here and there and of small size; but in Ceylon it is one of the chief woods, the average sales being 300 tons yearly. When the wood of this species is evenly black, it is sold as ebony; when it is at all streaked, it is sold as "bastard" ebony. Used for turning, cabinet work, piano keys, rulers, walking sticks, brushes and general furniture, in Europe; and in China, for chopsticks, pipes and carved stands.

Wright 146–151; Van Eed. 168.

The following are a few of the best-known commercial ebonies.

Diospyros melanoxylon Roxb.
British India and Ceylon.

This produces most of the ebony that comes from British India. It is rare in Ceylon.

Gamb. 461, *tab. IX, fig. 6;* Nörd. IX; Stone 154, *pl. X, fig. 85;* Wright 174–178.

Diospyros quaesita Thw. Calamander or Coromandel wood.
Ceylon.

Red, hazel-brown or chocolate-brown, with handsome black stripes. This very beautiful wood is found only in Ceylon and seems not to be plentiful there, but it has set a widely recognized standard of beauty. It is used for a great many different kinds of ornaments.

Wright 166–171; Boulger 178.

D. kurzii of the Andaman Islands, is said to furnish wood very much like calamander in ornamental value. *D. oocarpa* and *D. affinis* of Ceylon are also said to approach calamander in ornamental value, but they have a much larger proportion of the useless sapwood. The *camagon, Diospyros discolor* Willd., of the Philippines (Phil. Woods 380), is not to be distinguished in appearance from calamander. It is more plentiful and is at least as good a wood.

[4] Ann Roy. Bot. Gard. Peradeniya 2 (1904–05) 1–204.

Diospyros pilosanthera Blanco. Bolongeta.
Philippines.

This is a very good example of those ebonies which have a streaked heart and reddish sapwood. It is of equal beauty with *camagon*.

Phil. Woods 378.

Diospyros chloroxylon Roxb. The so-called "green ebony" of central and southern India.

Wood yellowish-gray, moderately hard. The greenish tinge seems not to be pronounced. Used principally for firewood.

Wiesner 2:1005; Gamb. 458; Nörd. VII (*D. tomentosa Poir.*).

Maba buxifolia Pers. Plate XXIX, fig. 95. Ebano; ironwood.
British India, Ceylon, tropical Africa, Madagascar, Burma, Malay Peninsula, Malay Archipelago to Australia.

Sapwood white; heartwood even dead black. Small pieces of ebony of good quality. Used for small ornaments, anchors for boats, etc.

Gamb. 452; Watt Dict. 5:102; K. & V. 1:23–25; Phil. Woods 383.

Wiesner 2:986–991 gives a discussion of ebonywood. Other discussions of ebony are found in Stevenson 258–261, Holtzapffel 83, and Boulger 169.

SYMPLOCACEÆ.

Wood white, close-grained, soft to hard. Pores small, numerous, usually evenly distributed. Pith-rays fine and moderately broad, the latter short.

Symplocos crataegoides Ham.
British India and Burma.

Turnery and carving.

Gamb. 464, *tab. X, fig. 1;* Nörd. VIII.

Many other species are found, but they are ordinarily rather small or of scanty occurrence.

STYRACACEÆ.

Wood white to light-brown, moderately hard, close-grained. Pores small, scanty, usually subdivided. Pith-rays short, fine, very numerous. Faint, white, regular, concentric, transverse bands.

Styrax benzoin Dryand. Menjan; kemajan; kamian; kajoe-limoeta.
Siam, Malacca, Sumatra, Java.

Wood of but little value, though it is occasionally used in house building and for bridges.

Van Eed. 171; Pierre 260; Ridl. 215.

Styrax serrulata Roxb.
British India and Burma.
Gamb. 467.

OLEACEÆ.

Wood white or yellowish-white or light-brown, sometimes with a dark irregular heartwood, usually close- and even-grained. Pores sometimes in white patches. Pith-rays usually fine, sharply defined. In *Osmanthus* the pores are in reticulate anastomosing patches. In *Osmanthus* and *Linociera* there are narrow concentric lines, the relationship of which to seasonal rings is very doubtful.

Linociera. Wood yellowish-white or light-brown, hard, close-grained. Pores small, usually in short radial groups. Pith-rays fine or very fine, distinct, numerous. Fine, fairly regular concentric lines prominent.

Linociera intermedia Wight.
British India.

Wood fine, like boxwood.

Gamb. 473.

Several other species of this region, which are usually either small or very much scattered, are found to produce the same kind of wood.

Osmanthus fragrans Lour.
British India to China and Japan..

Wood white, hard, close- and even-grained. Pores in irregular light-colored patches, radially elongated, arranged obliquely and branching; the patches somewhat distant and forming a net-work, and the pores small and numerous in them. White, very narrow parallel concentric lines, which look like seasonal rings, but are not. Pith-rays fine, uniform.

Gamb. 472; Nörd. IX.

Schrebera swietenioides Roxb. (*Nathusia swietenioides* (Roxb.) O. Ktze.) Moka (Hind.).
British India and Burma.

Wood brownish-gray, hard, close-grained; no definite heartwood, but irregular masses of purple or claret-colored wood in the center, and scattered throughout the tree. Seasonal rings indistinct. Pores small, often in small groups in radial arrangement. Pith-rays fine, numerous, uniform and at equal distances. Beams of weavers' looms, combs, turnery.

Gamb. 469, *tab. X, fig. 2;* Nörd. X; Watt Dict. 6^2:488.

SALVADORACEÆ.

Salvadora persica L.
India, Persia, Syria, Arabia, central Africa.

Wood white, soft. Pores small, in short radial lines, inclosed in oval patches of soft tissue, very scantily distributed, but prominent on a vertical section. Numerous fine, interrupted, concentric bands of wood

parenchyma, separating broader bands of firm texture, in which the fine and numerous pith-rays are distinctly visible.

Gamb. 476; Nörd. XI.

Salvadora oleoides Dene.
British India, Afghanistan.

Wood light-red, moderately hard, with a small, irregular, purple heartwood. Pores large and small, oval, often subdivided, surrounded by irregular patches of wood parenchyma, which are joined into wavy, irregular, zigzag, concentric bands; scanty, but much more numerous and prominent than in *S. persica*, prominent on a vertical section. Pith-rays fine, numerous, distinct, at unequal distances. Structural work, agricultural implements, Persian wheels and the knee timbers of boats.

Gamb. 477, *tab. X, fig. 4;* Nörd. X; Watt Dict. 6²:448.

LOGANIACEÆ.

Fagraea. Plate XXIX, fig. 96. Wood hard, close-grained, gray or light-brown. Pores large, scanty, often subdivided. Pith-rays fine, very numerous. Concentric pale bands numerous: in these there may be (extremely fine) pores.

Fagraea fastigiata Bl. Malebera; malbira.
Malay Peninsula, Java.

Wood of a dirty yellowish color with very close narrow rays, and scattered pores partitioned. It has a great reputation for resisting water, and if the trunks are used with the bark on, resist the teredo, so that it is a very valuable timber for wharfs and piles.

Ridl. 217; K. & V. 9:80.

Fagraea fragrans Roxb. Anan (Burm.); tembusu (M.); "kings-wood;" kajoe-radjah; urung (Phil.).
British India, Burma, Malay Peninsula and Archipelago.

Wood light-brown, hard, close-grained. Pores (or intercellular ducts) large, very scanty, often subdivided and filled with a white substance. Numerous pale concentric bands alternating with bands of firmer tissue in which the fine numerous pith-rays are distinctly visible. Numerous very fine, parallel transverse lines in longitudinal section. One of the most important woods of the Malay Peninsula. One of the best woods for piling. House building, boat anchors, etc. Very durable, untouched by white ants and fungus and lasts a long time in the ground.

Gamb. 496; Wiesner 2:1015; Ridl. 216; Watt Dict. 3:312; Van Eed. 179; K. & V. 9:86.

Fagraea speciosa Bl. Tembusu tembaga; tembusu talang; tembusu paya. Malay Peninsula.

Wood like that of *F. fragrans* but more compact and resinous, with a strong odor and showing no concentric lines. Very durable. House beams, bridges and planks.

Ridl. 216.

Fagraea wallichiana Benth.
Malay Peninsula.

Very heavy and darker in color than that of other species. A very fine compact wood.

Ridl. 217.

Strychnos nux-vomica L. Kajoe-oelar; "snakewood;" "strychnine tree;" bidara-pahit.
Ceylon, British India, Burma, Java.

Wood white, close-grained, durable. No heartwood, no seasonal rings. Pores of two classes; large pores very scanty; very small pores numerous, in irregular ramified patches, which are joined by concentric and oblique white lines. Pith-rays white, fine and moderately broad, numerous, sharply defined in the darker tissue. The large pores, which are prominent as white streaks on a vertical section are filled with a white pith-tissue, and sometimes ramify; they may be not vessels, but large intercellular ducts. The wood is bitter and is not eaten by white ants. Used for plow-shares, car-wheels, cots and fancy cabinet work.

Gamb. 497; Watt Dict. 6[3]:382; Van Eed. 190; K. & V. 9:65–68; Boulger 274.

Other species of *Strychnos* are also used, but their wood has a structure like that just described.

APOCYNACEÆ.

Wood white, soft to hard, even-grained, rarely with heartwood. Pores small or very small, scanty, in short or long radial groups. Pith-rays very fine, very numerous. Occasional light concentric lines as in *Alstonia*.

Alstonia macrophylla Wall. Plate XXX, fig. 97. Batino.
Philippines.

Much harder than *A. scholaris*. Without the white concentric lines. Pores distinctly in radial rows. Structural work.

Phil. Woods 377.

Alstonia scholaris (L.) R. Br. Plate XXX, fig. 98. Dita; chatwan; Plai; "corkwood."
British India and Ceylon to New Guinea and Australia, Philippines.

Wood white, soft, even-grained, seasons badly, and soon gets moldy and discolored if allowed to season in the log. Pores moderate-sized, oval, subdivided, ringed, scanty. Pith-rays fine, wavy, irregularly distributed, with numerous intermediate extremely fine rays. Numerous

fine, wavy, concentric lines at unequal distances. Used for floats, blackboards, tool handles, scabbards, coffins, etc.

Gamb. 483, *tab. X, fig. 5;* Becc. 580; Nörd. X; Ridl. 216; Phil. Woods 382; Watt Dict. 1:199; Van Eed. 174; K. & V. 1:117–120; Wiesner 2:1022; Lewis 309.

Dyera. Wood white, very soft and very light, with large pores, which are rather few in number. Pith-rays close; numerous, fine, irregular transverse lines of wood parenchyma.

Dyera costulata Hook. f. Jelutong.
Malay Peninsula.

Used for making clogs, and also for planking, boxes, models, the cheaper grade of Chinese coffins, etc.

Ridl. 215.

Dyera lowii Hook. f. Plate XXX, fig. 99. Jelutong, djeloetoeng, djiuluton.
Borneo.

Much the same uses as the preceding. Both of these species furnish wood which closely resembles that of *Alstonia scholaris.*

Van Eed. 176; Bargagli-Petrucci 84; Becc. 580.

Holarrhena antidysenterica Wall. Kurchi bark; conessi bark.
British India and Burma.

Wood white, soft, even-grained. Seasonal rings marked by a faint line. Pores small, numerous, grouped in radial lines. Pith-rays fine, very numerous. Cellular tissue loose. Wood carving.

Gamb. 484; Nörd. VII; Watt Dict. 4:258.

Wrightia. Wood white, moderately hard. Pores small, scanty, in short radial lines. Pith-rays very fine, numerous.

Wrightia javanica DC. Bintaos; mentaos, djalitri.
Java, British India.

Used for wood carving and ornament.

Van Eed. 177; K. & V. 1:112–114.

Wrightia laniti (Blanco) Merr. Plate XXX, fig. 100. Lanete.
Philippines.

This wood is not to be distinguished from the last. It is the best Philippine wood for carving; and it is used in the carving of sacred images, light construction, bolo scabbards, canes, cooking utensils, chairs, musical instruments, shoes, trunks, turning, wardrobes, window-sills.

Phil. Woods 385.

Wrightia tinctoria R. Br.
British India and Burma.

Wood ivory-white, moderately hard, even-grained. Pores scanty, very small, in short radial lines. Pith-rays extremely fine, numerous. Wood carving.

Gamb. 486; Watt Dict. 6^4:317.

Wrightia tomentosa Roem. & Schult.
British India, Ceylon, Burma.

Wood white or yellowish, moderately hard, even-grained. Seasonal rings marked by a pale line and occasionally more pores; pores in the rest of the wood very small, in short radial groups, scanty. Pith-rays very fine and extremely fine, very numerous, closely packed. Turnery and wood carving.

Gamb. 487; Watt Dict. 6[4]:317.

Other genera of *Apocynaceae* which occasionally furnish pieces of fine-grained wood are *Cerbera*, *Kickxia*, *Ochrosia* and *Tabernaemontana*. These usually are of but scattered occurrence and small size.

BORRAGINACEÆ.

No well-marked character for the family.

Cordia. Pores of variable size, more or less joined by concentric, often broken, belts of loose tissue, separated by darker belts in which the pith-rays are prominent. *C. myxa* and *C. octandra* have soft woods, the others have hard woods much resembling good teak; durable and suitable for carpentry.

Cordia fragrantissima Kurz.
Burma.

Wood moderately hard, reddish-brown with darker streaks, beautifully mottled, has a fragrant scent. Pores moderate-sized to large, in roundish patches, which are joined by occasional, broken, concentric lines. Pith-rays rather distant, moderately broad. Small quantities have been exported to London.

Gamb. 501, *tab. XI, fig. 2;* Nörd. X.

Cordia myxa L.
Egypt to tropical Australia; also frequently planted.

Wood grayish-brown, moderately hard. Pores moderate-sized or large, scanty, scattered and frequently double, or partitioned, joined by angled wood cells; the alternate bands denser and closer in texture. Pith-rays short, moderately broad, shallow. Boat building, well-curbs, agricultural implements, gunstocks, canoes.

Gamb. 500, *tab. XI, fig. 1;* Nörd. X; K. & V. 7:64–66.

Ehretia. Wood very light-brownish or yellowish-white, moderately hard, even-grained, usually rough. Pores small, in radial lines or scattered, in some species larger in the earlier-formed wood where they mark the seasonal rings. Pith-rays fine to moderately broad, regular.

Ehretia acuminata Br.
British India, Burma, Java to Australia.

Wood very light-brown, rough, moderately hard, resembling that of the ash. Pores of two kinds: those in the earlier-formed wood, large and closely packed in a line, making conspicuous seasonal rings; those in the rest of the wood small, scattered. Pith-rays short, moderately

broad, not numerous. Scabbards, sword-hilts, gun-stocks, and used for building and agricultural implements.

Gamb. 503, *tab. XI, fig. 3;* Nörd. III; K. & V. 7:74–76.

Ehretia laevis Roxb.
British India, Persia, China.

Wood grayish or brownish-white, moderately hard, even-grained. Seasonal rings indistinctly marked. Pores small, grouped in small clusters or radial lines. Pith-rays fine, short, numerous. Tough and durable; agricultural implements and building.

Gamb. 503; Watt Dict. 3:203.

Ehretia javanica Bl. (*E. wallichiana* Hook. f. & Th.) Kendal; Ki-bako.
British India, Burma and Java.

Wood yellowish-white, moderately hard, rough. Seasonal rings marked by light-colored belts. Pores small and moderate-sized, in scattered groups and short radial lines. Pith-rays short, numerous, uniform. Building, charcoal, tea-boxes.

Gamb. 504; Nörd. X; K. & V. 7:76–78; Van Eed. 182.

VERBENACEÆ.

Wood usually of good quality, not liable to warp or split, of various colors. Pores usually moderate-sized, scanty, those in the earlier formed wood larger and marking the seasonal rings. Pith-rays generally fine and moderately broad, regular. The wood of *Avicennia* is quite anomalous.

Avicennia officinalis L. Plate XXX, fig. 101. Api-api (M.).
Mangrove swamps, tropical East Africa to Australia.

Wood brown or gray, hard and heavy, in alternate layers of pore-bearing tissue and loose large-celled tissue without pores; the former layer shows the large, moderate-sized or small pores in radial strings of 1 to 5 between the fine short pith-rays; the latter is much narrower and darker, forming belts which occasionally join each other, so that the layers are clearly not seasonal growths. Wood very brittle. Firewood, mills for husking paddy, rice-pounders, and oil-mills.

Gamb. 546, *tab. XI, fig. 6;* Nörd. III; Watt Dict. 1:360; K. & V. 7:217–221; Van Eed. 187; Ridl. 219.

Callicarpa. Wood white or brownish-white, even-grained. Pores small to large, usually in radial lines. Pith-rays moderately broad to broad. Usually small shrubs.

Callicarpa arborea Roxb. Ambon (M.).
British India and Burma, Malay Peninsula.

Wood light-brownish-white, moderately hard, even-grained. Seasonal rings marked by a line of harder wood. Pores rather scanty, small to large, oval and often elongated, subdivided into numerous compartments, often in radial lines. Pith-rays broad, with numerous fine rays between

them, well marked on a radial section; the distance between the rays greater than the transverse diameter of the pores. Charcoal.

Gamb. 525; Ridl. 218.

Gmelina arborea Roxb. Goomar teak; peddah gomra; gumaldi.
British India, Burma, Ceylon.

Wood yellowish, grayish, or reddish-white, with a glossy luster, even-grained, soft, light and strong, durable, does not warp or crack. Seasonal rings marked either by a white line or by more numerous pores in the spring wood. Pores large and moderate-sized, often subdivided, rather prominent on a vertical section; sometimes arranged in rough, more or less concentric lines. Pith-rays short, moderately broad, prominent. Wood easily worked and readily takes paint or varnish; it is very durable under water. Highly esteemed for planking, furniture, door-panels, carriages and palanquins, and for well-work, boats, toys, packing-cases and all ornamental work; it is used in Burma for carving images and canoes. Roxburgh says it is very like teak.

Gamb. 537–539; Nörd. IV; Watt Dict. 3:515; E.-Pr. 4^{3a}:173.

Peronema canescens Jack. Soengkei-melajoe (Sumatra); loewis-madang (Borneo).

Malay Peninsula, Sumatra, Java, Borneo.

Wood white, light but fairly hard; rings distinct, marked with a close continuous line of pores. Pores large, few, often partitioned. Used for house posts and bridge building.

Van Eed. 188; Ridl. 219; K. & V. 7:214.

Premna. Wood light-brown or gray, often streaked, moderately hard. Pores small or moderate-sized, rather scanty, often subdivided. Pith-rays fine or moderately broad, with a silver grain of very small plates.

Premna integrifolia L.
Ceylon, British India, Burma, Philippines.

Wood light-creamy-brown, moderately hard, even-grained. Pores moderate-sized, sometimes subdivided, numerous. Pith-rays fine, close, fairly numerous. Wood with pleasant scent, fresh and fragrant, not so aromatic as sandal.

Gamb. 535.

Premna pyramidata Wall.
Burma.

Wood very light-brown or yellowish-white, often streaked, hard, close-grained, smooth. Pores small or moderate-sized, sometimes subdivided, fairly numerous. Pith-rays fine to moderately broad, numerous, close. Wood seasons and polishes well and is used for weaving-shuttles.

Gamb. 536, *tab. XI, fig. 5;* Nörd. IV.

Premna tomentosa Willd. Boengboelan; boelang; bolang; gadoengan; gadoeng.

Ceylon, British India, Java.

Wood said to be almost as durable as teak. Used for house building.

Van Eed. 188; K. & V. 7:179–182.

Tectona grandis L. f. Plate XXX, fig. 102. Teak; jati.

British India, Burma, Java, Siam, and much planted.

"The best teak is from Malabar, then the Java teak; the Burmese and also the Siamese teak is usually lighter in weight and of brighter color; the greater part of this comes by way of Bangkok, Moulmein, or Rangoon.

"Wood moderately hard, strongly and characteristically scented and containing an oil which is easily perceptible to the touch and is preservative; sapwood white, usually small; heartwood dark, golden-yellow, turning brown, dark-brown and finally almost black with age. Annual rings marked by one or more lines of regularly arranged pores, often set in a belt of loose tissue; in the rest of the wood the pores are scattered, scanty, sometimes subdivided, variable in size from small to moderate-sized, a few large. Pith-rays moderately broad to broad, fairly numerous, giving a conspicuous handsome silver-grain of elongated plates. Pith large quadrangular.

"The small pieces left in working up big logs are worked up into shingles. There is one difficulty in the utilization of teak wood, viz., that it is so often unsound at the center, necessitating scantlings being cut so as to leave the center out. The unsoundness is due partly to the large soft pith which is easily bored by insects, allowing damp and rot to enter afterwards, and partly, perhaps, to so much of the teak still brought out coming from old overmature trees. Teak is the chief export timber of India and Burma, also the chief building timber of the country. The wood is exported chiefly for shipbuilding, especially for the backing of armor plates in battle ships and for the decks of most vessels, also for the construction of railway carriages and for the best class of house carpentry, being admirably suited for staircases, balustrades, door and window frames and furniture. In India it is used for all purposes of house and ship building, for bridges, railway sleepers, furniture, shingles, etc. It is used for carving, the Burmese carved teakwood being especially noted, in Burma itself carved 'Kyaungs,' or monasteries, being prominent in almost every village of any importance. The wood is very durable, as is shown by the specimens obtained by Brandis from the old city of Vijiyanagar (Hampi) in the South Deccan, which are still sound and good though probably five hundred years old. There are also in the Dehra collection pieces, now quite black and very hard, from the ancient city of Ujjain in Ajmere, whose age must be very

great. The durability is probably due to the large amount of oil contained in the wood. This oil is used medicinally, as a substitute for linseed oil and as a varnish." (Gamb. 526–534.)

Nörd. IV (sapwood only); Watt Dict. 6⁴:1–14; Ridl. 220; Winton 229; Wiesner 2:1003–1005; K. & V. 7:165–172; Van Eed. 189–194; Blits 48–50; Phil. Woods 394; Stone 170; Stevenson 269–274; Holtzapffel 107.

The teak is probably the best known of all tropical woods. It has a wider range of usefulness than any other and has become the standard for estimating the value of other woods from the rest of the world. Other woods surpass it for special purposes, but for general utility there is none to equal it. Moreover, the way in which it adapts itself to cultivation on comparatively poor soil makes it certain that it can maintain a place in the world's markets indefinitely.

Tectona hamiltoniana Wall.
Burma.

A hard and very heavy wood, which is light-brown, close-grained, with an irregular dark-brown heartwood. Pores small, often subdivided, rather scanty. Pith-rays fine, the distance between them equal to the transverse diameter of the pores. Seasonal rings marked by a continuous white line with somewhat larger pores. Harder and heavier than teak.

Gamb. 534.

Vitex. Wood gray, brown or olive-brown, moderately hard to very hard. Pores small or moderate-sized. Pith-rays fine to moderately broad.

Vitex aherniana Merr. Plate XXX, fig. 103. Sasalit.
Philippines.

Very hard and heavy to very heavy. Dark-brownish-yellow. Very durable; house posts, etc.

Phil. Woods 392; Gard. 67.

Vitex altissima L. f. Myrole; mibella.
British India and Ceylon.

Wood gray with a tinge of olive-brown, hard, close-grained, polishes well. Seasonal rings distinctly marked by a belt of firmer wood on the outer edge. Pores small, scanty. Pith-rays fine, numerous, wavy, very heavy. Structural work and carts.

Gamb. 540; Watt Dict. 6⁴:247.

Vitex littoralis Dcne. (*Vitex timoriensis* Walp.) Plate XXX, fig. 104. Molave.
Philippines, Timor.

Wood hard and heavy; pale-yellow; fine and usually straight-grained. Seasonal rings present, diffuse-porous. Slightly acid odor. Bitter taste. Turning greenish-yellow when treated with an alkaline solution. Staining water a greenish-yellow color. Often said to be the finest Philippine wood. Much valued for house and ship building. Classed in the third line of Lloyd's Register. Some of its uses in the Philippines are:

Axles, beams, bridges, cabinet making, carabao yokes, cogwheels, general high-grade construction, docks, doors, finishing of houses, firewood, flooring, footings in the ground, futtocks, palo (wooden club to pound rice), posts, joists, knees, piles, pillars, pinions, planks, plows, rafters, rice mortars, shipbuilding, cutwater, ships' knees, ribs, frames, siding of houses, sleepers, sternposts, sugar presses, wedges, wheel rims, undersills, paving blocks, railroad ties. For many purposes, it seems to be fully the equal of teak.

Phil. Woods 389; Gardner 55; Van Eed. 194; Boulger 217; Semler 685.

Vitex pubescens Vahl. Halban; calipapa; leban; kuzoe-arak; molave.

British India, Burma, Andaman Islands, Borneo, Philippine Islands, Malay Archipelago and Peninsula.

Wood smooth, reddish-brown or olive-brown, very hard, close-grained, seasonal rings marked by a more or less sharp line and by a broad belt of firmer wood on the outer edge. Pores small to moderate-sized, scanty, uniformly distributed. Pith-rays fine and very fine, numerous, equidistant. Difficult to distinguish from the preceding. Durable, used for structural work, mine-props, etc.

Gamb. 541; Ridl. 218; Van Eed. 195; K. & V. 7:202–204.

Other species of *Vitex* are also used, furnishing wood of excellent quality.

BIGNONIACEÆ.

Pores usually moderate-sized, ringed or in patches of loose texture which are often oblique or confluent into more or less broken concentric belts; they are often filled with resin. Pith-rays fine, regular.

Dolichandrone. Pores rather scanty, small to moderate-sized, in oblique lines and sometimes in concentric bands. Pith-rays fine, numerous. Texture, color and hardness variable.

Dolichandrone spathacea (L. f.) K. Sch. (*D longissima* (Lour.) K. Sch., D. rheedii Seem.) Tui (Phil.).

Malabar to New Guinea.

Wood white, soft. Pores small, often subdivided, in wavy, narrow, concentric bands. Pith-rays very fine, very numerous. Not durable. Used for temporary construction.

Gamb. 512; Van Eed. 183; K. & V. 1:69–71; Becc. 581.

Heterophragma. Pores moderate-sized, ringed. Pith-rays fine, the distance between the rays being equal to or greater than the transverse diameter of the pores. No regular distinct concentric bands.

Heterophragma adenophyllum Seem.

British India.

Sapwood light-yellow; heartwood orange-yellow, with occasional darker streaks, moderately hard to hard. Pores moderate-sized, ringed, filled with yellow resinous matter, uniformly distributed, but occasionally running into more or less concentric lines. Pith-rays fine to moderately

broad, the distance between them equal to or greater than the diameter of the pores.

Gamb. 514, *tab. XI, fig. 4;* Nörd. IX (sapwood).

Millingtonia hortensis L. Sekar-poetih; potean.
British India, Burma and Malay Archipelago.

Wood soft, yellowish-white. Seasonal rings marked by the younger wood with few pores and the older wood with rather more numerous ones. Pores small, numerous, arranged in light-colored patches which run together to form a more or less concentric zigzag pattern. Pith-rays fine, the distance between the rays somewhat larger than the transverse diameter of the pores. Very soft and corky; used for boxes and other temporary uses.

Gamb. 509; Watt Dict. **5**:247; Van Eed. 183.

Oroxylum indicum Benth. Pincapincahan (Phil.); pohon-pedang, kajoe-sabel (M.).
British India, Burma, Andamans, Ceylon, Malaya.

Wood yellowish-white, soft; no heartwood. Pores scanty, moderate-sized, uniformly distributed. Seasonal rings marked by more numerous pores. Pith-rays fine to moderately broad. Matchwood.

Gamb. 510; Ridl. 218; Van Eed. 184.

Pajanelia rheedii DC.
British India, Burma, Andaman Islands.

Wood orange-brown, very hard, close-grained. Pores large, occasionally filled with yellow resin; each pore surrounded by a narrow ring of wood parenchyma, uniformly distributed. Pith-rays fine, very numerous, uniform and nearly equidistant, prominent. Wood very similar to that of *Planchonia littoralis,* but differs by more prominent pith-rays and larger pores, which are not arranged in bands, but isolated.

Gamb. 517.

Various species of *Radermachera* and, possibly, other genera occasionally furnish trees of sufficient size to give soft and easily worked woods.

Stereospermum. Wood grayish-brown, heartwood (if present) yellowish-brown. Pores small to large, variable in size, scanty, surrounded by wood parenchyma, the patches joined into more or less concentric belts. Pith-rays fine to moderately large, rather scanty.

Stereospermum chelonioides DC.
British India, Burma, Ceylon, Malay Peninsula.

Wood hard, gray, no heartwood. Pores moderate-sized and large, joined by narrow, irregular, wavy, interrupted belts and lines of soft tissue. Pores frequently filled with a white substance of a resinous nature, which is prominent on a vertical section. Pith-rays short, wavy, moderately broad, numerous. House building, furniture, canoes, tea-boxes.

Gamb. 514; Ridl. 217; Watt Dict. 6^3:466; Van Eed. 184.

Stereospermum suaveolens DC.
British India and Ceylon.

Wood hard; sapwood gray; heartwood small, yellowish-brown, beautifully mottled with darker streaks, very hard, seasons and polishes well. Pores moderate-sized, inclosed in patches of wood parenchyma which are more or less concentrically arranged and sometimes run together into concentric belts. Pores frequently filled with a white shining substance, which becomes yellow in the heartwood. Pith-rays fine, sharply defined, numerous, wavy, equidistant. Durable, easy to work and good for building, but the amount of heartwood is small. An excellent firewood and makes good charcoal.

Gamb. 515; Watt Dict. 6³:367.

RUBIACEÆ.

Wood white, yellow, or rarely red, close- and even-grained, generally hard or moderately hard; usually no heartwood. Pores small or very small; in *Anthocephalus cadamba* and a few other species, moderate-sized. Pith-rays uniform, equidistant, fine or very fine, often closely packed. In *Morinda* the pores collect in patches, but otherwise the structure is very uniform. Many of the species have woods resembling boxwood, and worthy of practical test to see if they could not be used as substitutes for it.

Adina. Wood yellowish, moderately hard to hard, even-grained. Pores small, numerous. Pith-rays fine and very fine, numerous.

Adina cordifolia Hook. f.
British India, Burma, Ceylon.

No heartwood. Seasonal rings faint. Pores small, numerous, evenly distributed. Pith-rays very fine, short, numerous. Combs, turnery, house posts. Durable.

Gamb. 401, *tab. IX, fig. 2;* Nörd. VII, IX; Watt Dict. 1:114.

Adina rubescens Hemsl. Berombong (M.).
Malay Peninsula.

Heartwood yellow, with distinct rings. Hard and heavy wood suitable for building.

Ridl. 209.

Anthocephalus cadamba (Roxb.) Miq. Henhja, kajoe-koening (M.).
Southeastern Asia, Malay Archipelago, New Guinea.

Wood white, with a yellowish tinge, soft, even-grained. Pores large, oval, elongated, subdivided, sometimes in short radial lines, scanty. Pith-rays fine, numerous, close together, bent outward where they touch the pores. Structure very similar to that of *Sarcocephalus cordatus* Miq. Structural work, joinery, tea-chests.

Gamb. 400; Nörd. IX; Watt Dict. 1:266; Van Eed. 154; K. & V. 8:8–11.

Canthium. Wood hard, close-grained. Pores very small, numerous. Pith-rays fine and very fine, numerous, regular.

Canthium didymum Roxb. Butulang.
British India, Ceylon, Burma, Malay Peninsula.

White or light-brown. Seasonal rings marked by a dark line with few or no pores. A fine wood used for agricultural purposes. In Ceylon, its resemblance to boxwood has caused it to be called "Ceylon boxwood."

Gamb. 419; Ridl. 211.

Gardenia. Wood creamy-white, smooth, close-grained, hard, but cuts easily. Pores small to extremely small, evenly distributed, often scanty. Pith-rays short, very fine to fine, numerous. Like the species of *Randia,* those of *Gardenia* have the characters of boxwood, and deserve attention as possible substitutes for the cheaper rougher work of engraving, tool-handles, etc.

Gardenia barnesii Merr. Plate XXX, fig. 105.
Philippines.

Wood very hard and very heavy, white, much resembling boxwood, for which it could possibly be substituted. An excellent wood for small ornaments.

Gardenia coronaria Ham.
British India and Burma.

Combs and turnery, liable to crack.

Gamb. 416; Nörd. IV (*G. costata*).

Gardenia gummifera L. f.
British India.
Gamb. 415; Watt Dict. **3**:481.

Gardenia tubifera Wall. Delima hutan (M.).
Malay Peninsula, Sumatra, Borneo.

Wood white, grain fine, medium hard and heavy, splits in drying. Used for house building and is fairly durable.

Ridl. 210; Van Eed. 115; K. & V. **8**:90.

Guettarda speciosa L. Seacoast teak; Ketapang-ketek (M.).
Seacoasts throughout the Indo-Malayan region.

Wood yellow, with a tinge of red. Pores small, often in radial lines. Pith-rays moderately broad and very fine.

Gamb. 418; K. & V. **8**:129–131.

Hymenodictyon excelsum Wall.
British India, Burma, Philippines.

Wood white, when cut up fresh; if cut up dry, brownish-gray; soft. Seasonal rings indistinctly marked. Pores moderate-sized, scanty, single or subdivided. Pith-rays few, moderately broad, alternating with others, fine, bent around the pores. Wood cells large. Tea-boxes, scabbards, grain-measures, palanquins, toys.

Gamb. 406; Nörd. IX; Watt Dict. **6**[1]:349; K. & V. **8**:50–52.

Ixora. Wood brownish, hard, close-grained. Pores small. Pith-rays very fine, numerous, regular. Very numerous species but usually of relatively small size.

Gamb. 420; Ridl. 211; K. & V. 8:146–169.
Pavetta and *Coffea* are much like the last.

Mitragyne. Wood reddish- or yellowish-brown. Pores small to moderate-sized, not very numerous. Pith-rays fine, numerous, uniform. Wood cells usually rather large.

Mitragyne parvifolia Korth. (*Stephegyne parvifolia* Korth.) Kajoe mas, kajoe-koening (M.).
British India, Burma, Ceylon.

Wood light-pinkish-brown, moderately hard, even-grained, much resembling that of *Adina cordifolia,* but rather harder, and at once recognized by its different color. Pores small, numerous, uniformly distributed. Pith-rays very fine, numerous, short. The wood is easily worked and polishes well; it is durable, if not exposed to wet. It is used in building, furniture, agricultural implements, combs, cups, spoons and platters, and for turned and carved articles.

Gamb. 403; Nörd. VII and X; Van Eed. 155; K. & V. 8:38–40.

Morinda tinctoria Roxb. Mengkudu.
British India, Burma, Ceylon, Malay Peninsula and Archipelago.

Wood red, often yellow with red streaks, moderately hard, close-grained. Seasonal rings fairly marked. Pores small, scanty, in radial or oblique groups, rather distant from each other. Pith-rays fine and moderately broad, rather distant. Durable; plates and dishes.

K. & V. 8:192–194; Gamb. 422; Ridl. 211.

Nauclea sp. Plate XXX, fig. 106. Calamansanay.
Philippines.

Wood hard and heavy, yellow with a beautiful rose tint; close- and straight-grained. No seasonal rings. Pith-rays very fine, pores small and scattered. Used for flooring, masts of boats, beams in interior construction, posts for houses or in contact with the ground, shipbuilding, telegraph poles, window sills.

Phil. Woods 378.

Randia. Wood creamy-white, light-brown or grayish-brown, smooth, close-grained, hard. Pores small or very small, evenly distributed. Pith-rays fine and very fine, numerous.

Randia dumetorum Lam.
British India, Burma, Ceylon, Abyssinia, China, Sunda Islands.

Seasonal rings marked by a belt without pores. Agricultural implements, fences, fuel.

Gamb. 413; Watt Dict. 6:391; K. & V. 8:96.

Sarcocephalus cordatus Miq. Plate XXX, fig. 107. Bancal (Phil.); kajoemas (M.); bakmi (Ceylon); "yellow wood."

Ceylon, Burma, Malacca, Philippines, Malay Archipelago, New Guinea, North Australia.

Wood soft, sapwood light-yellow, heartwood bright-yellow. Pores moderate-sized, rather scanty, usually subdivided, in rough radial lines between the numerous fine pith-rays which bend round them. Furniture, door frames, panels, sandals, tea-chests.

Gamb. 400; Nörd. VI; Phil. Woods 375; Lewis 309; Van Eed. 157; K. & V. 8:13–15.

Sarcocephalus junghuhnii Miq. Mangel; chermin ayer (M.); mambog (Phil.).

Malay Peninsula, Philippine Islands.

Wood fairly heavy, bright-yellow when fresh, turning brown; not very hard. Sapwood not very distinct. Pores large and small mixed, rays very close and fine, rings fairly distinct and regular, narrow and almost poreless. A good ordinary building wood, durable.

Ridl. 209.

Scyphiphora hydrophyllacea Gaertn. Cingum (M.).

In the mangrove swamps throughout this region.

Wood dark-brown, fine-grained, rings obscure, pores exceedingly small, and pith-rays very fine.

Ridl. 210; K. & V. 8:125–127.

Urophyllum glabrum Wall.

Malay Peninsula.

Maingay says *Urophyllum* is the *kayu gading;* the wood is very pale whitish-red or reddish-white, grain medium, very hard, splits very slightly in drying. Used for the manufacture of kris handles and probably valuable for carving or wood engraving. The name *kayu gading* is applied to several plants which have white (like ivory) hard wood, chiefly species of *Canthium, Petunga venulosa* and also *Hunteria corymbosa.*

Ridl. 210; K. & V. 8:66–68.

Wendlandia. Wood reddish-brown. Pores small, evenly distributed. Pith-rays of two kinds, very fine and fine or moderately broad, numerous.

Wendlandia exserta DC.

British India.

Hard. Seasonal rings marked by fewer pores in the later-formed wood. Building, agricultural implements, house posts.

Gamb. 408; Nörd. IX (*W. excelsa*); Watt Dict. 6[4]:402.

Other species of the genus in India and Malaya produce wood very much like that already described, but usually in small pieces.

COMPOSITÆ.

Wood soft and light. Pores moderate-sized, rather scanty. Pith-rays moderately broad to fine.

Vernonia arborea Ham. Plate XXX, fig. 108. Merambong (M.).
Malay Peninsula, Philippine Islands, Malay Archipelago.

Wood white or brownish; used for house building but is not durable.

Ridl. 211; K. & V. 5:50–54.

ILLUSTRATIONS.

Plate XXII.

Fig. 1. Agathis alba.
2. Pinus insularis.
3. Casuarina equisetifolia.
4. Engelhardtia serrata.
5. Quercus soleriana.
6. Artocarpus cumingiana.
7. Sloetia sideroxylon.
8. Taxotrophis ilicifolia.
9. Helicia philippinensis.
10. K'runtum.
11. Scorodocarpus borneensis.
12. Strombosia philippinensis.

Plate XXIII.

Fig. 13. Michelia champaca.
14. Canagium odoratum.
15. Myristica philippensis.
16. Beilschmiedia cairocan.
17. Cinnamomum camphora.
18. Eusideroxylon zwageri.
19. Litsea perrottetii.
20. Parinarium griffithianum.
21. Pygeum preslii.
22. Pithecolobium acle.
23. Acacia melanoxylon.
24. Sindora cochinchinensis.

Plate XXIV.

Fig. 25. Pericopsis mooniana.
26. Intsia bijuga.
27. Cassia nodosa.
28. Pterocarpus indicus.
29. Kingiodendron alternifolium.
30. Erythrina indica.
31. Caesalpinia sappan.
32. Parkia roxburghii.
33. Ixonanthes icosandra.
34. Chloroxylon swietenia.
35. Fagara integrifoliola.
36. Murraya exotica.

Plate XXV.

Fig. 37. Irvingia malayana.
38. Canarium commune.
39. Aglaia clarkii.
40. Amoora aherniana.
41. Toona calantas.
42. Sandoricum indicum.
43. Xylocarpus granatum.
44. Bischofia trifoliata.
45. Koordersiodendron pinnatum.
46. Melanorrhoea sp.
47. Urandra sp.
48. Dodonaea viscosa.

Plate XXVI.

Fig. 49. Euphoria cinerea.
50. Pometia pinnata.
51. Zizyphus zonulatus.
52. Gonystylus bancanus.
53. Berrya ammonilla.
54. Bombycidendron campylosiphon.
55. Bombycidendron campylosiphon (long. section).
56. Thespesia populnea.
57. Pterocymbium tinctorium.
58. Tarrietia javanica.
59. Tarrietia sylvatica.
60. Dillenia sp.

PLATE XXVII.

FIG. 61. Calophyllum inophyllum.
62. Calophyllum borneense.
63. Cratoxylon sp.
64. Mesua ferrea.
65. Vatica sp.
66. Balanocarpus sp.
FIG. 67. Shorea balangeran ?
68. Hopea acuminata.
69. Dryobalanops sp.
70. Shorea guiso.
71. Dipterocarpus grandiflorus.
72. Shorea polysperma.

PLATE XXVIII.

FIG. 73. Red Lauan.
74. Anisoptera sp.
75. White Lauan.
76. Cotylelobium sp.
77. Cotylelobium sp.
78. Seriah puteh.
FIG. 79. Homalium sp.
80. Octomeles sumatrana.
81. Lagerstroemia speciosa.
82. Sonneratia pagatpat.
83. Carallia integerrima.
84. Bruguiera gymnorrhiza.

PLATE XXIX.

FIG. 85. Ceriops tagal.
86. Rhizophora sp.
87. Lumnitzera littorea.
88. Terminalia nitens.
89. Eugenia sp.
90. Xanthostemon verdugonianus.
FIG. 91. Polyscias nodosa.
92. Aegiceras floridum.
93. Illipe betis.
94. Palaquium sp.
95. Maba buxifolia.
96. Fagraea sp.

PLATE XXX.

FIG. 97. Alstonia macrophylla.
98. Alstonia scholaris.
99. Dyera lowii.
100. Wrightia laniti.
101. Avicennia officinalis.
102. Tectona grandis.
FIG. 103. Vitex aherniana.
104. Vitex littoralis.
105. Gardenia barnesii.
106. Nauclea sp.
107. Sarcocephalus cordatus.
108. Vernonia sp.

(*All figures with a magnification of five diameters.*)

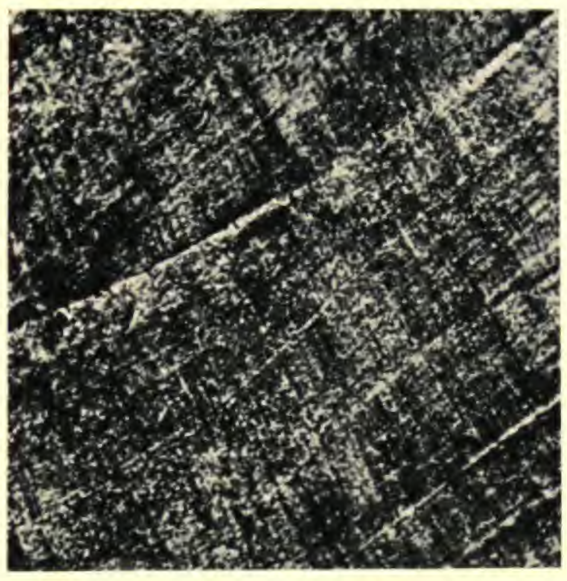

FIG. 1.—*Agathis alba.*

FIG. 2.—*Pinus insularis.*

FIG. 3.—*Casuarina equisetifolia.*

FIG. 4.—*Engelhardtia serrata.*

FIG. 5.—*Quercus soleriana.*

FIG. 6.—*Artocarpus cumingiana.*

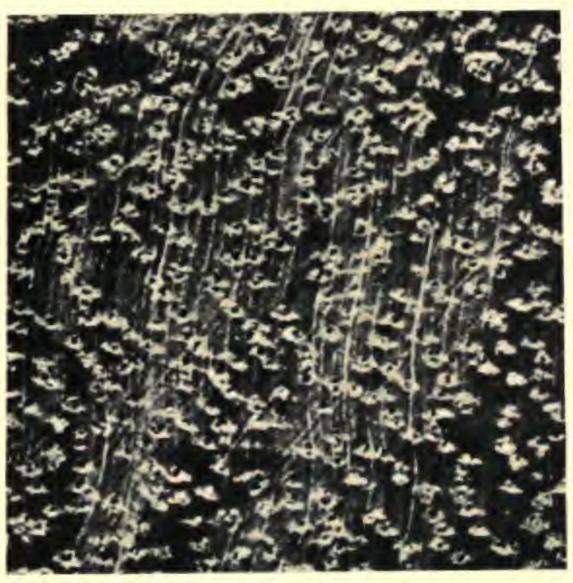

FIG. 7.—*Sloetia sideroxylon.*

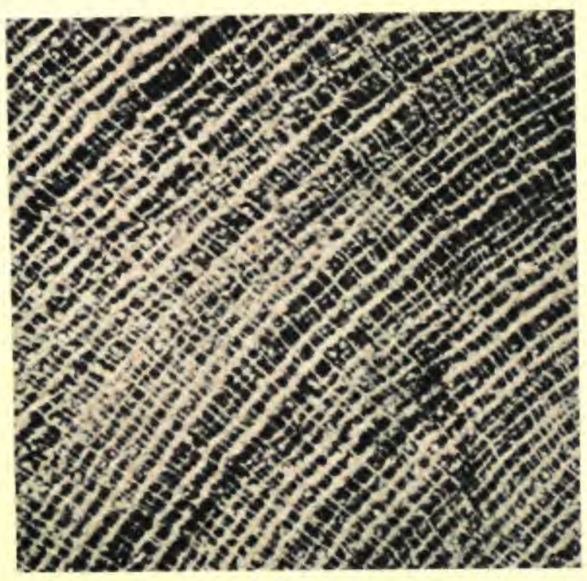

FIG. 8.—*Taxotrophis ilicifolia.*

FIG. 9.—*Helicia philippinensis.*

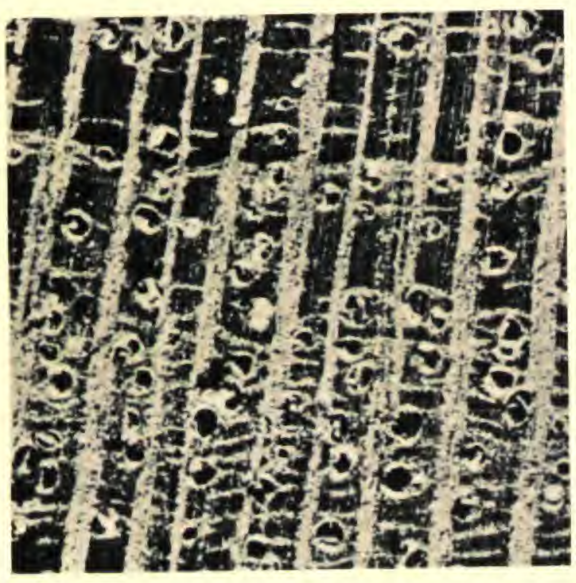

FIG. 10.—*K'runtum.*

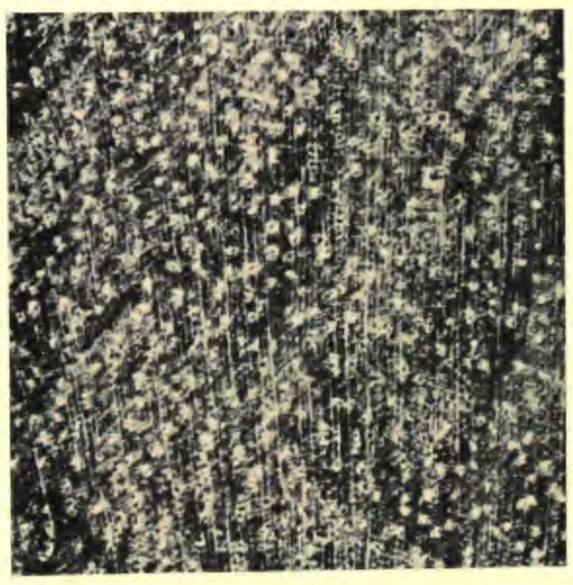

FIG. 11.—*Scarodocarpus borneensis.*

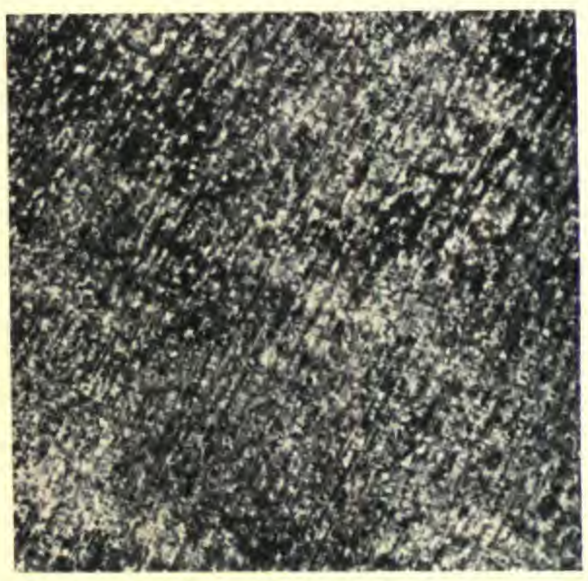

FIG. 12.—*Strombosia philippinensis.*

PLATE XXII.

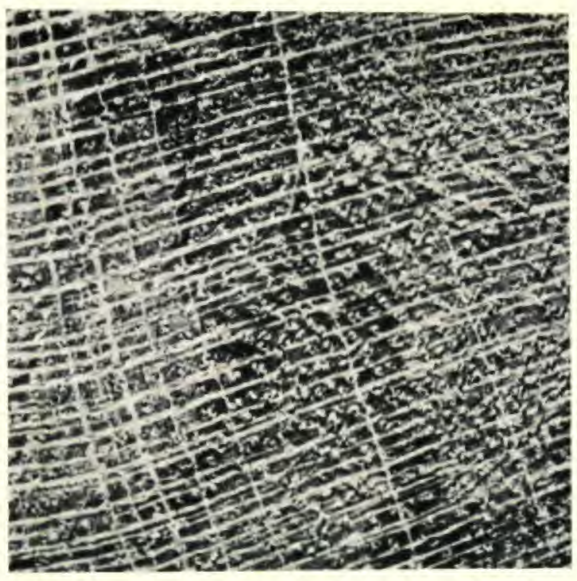

FIG. 13.—*Michelia champaca.*

FIG. 14.—*Canangium odoratum.*

FIG. 15.—*Myristica philippensis.*

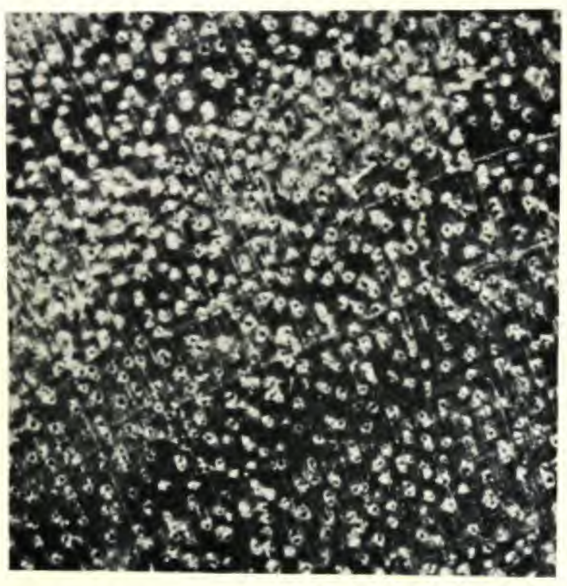

FIG. 16.—*Beilschmiedia cairocan.*

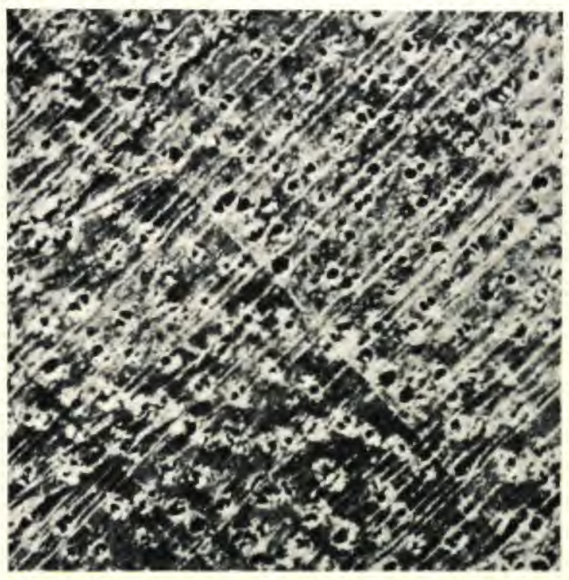

FIG. 17.—*Cinnamomum camphora.*

FIG. 18.—*Eusideroxylon zwageri.*

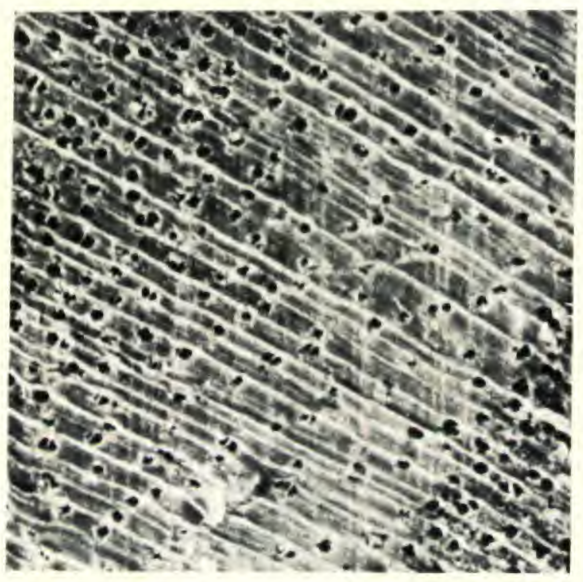

FIG. 19.—*Litsea perrottetii.*

FIG. 20.—*Parinarium griffithianum.*

FIG. 21.—*Pygeum preslii.*

FIG. 22.—*Pithecolobium acle.*

FIG. 23.—*Acacia melanoxylon.*

FIG. 24.—*Sindora cochinchinensis.*

PLATE XXIII.

FIG. 25.—*Pericopsis mooniana.*

FIG. 26.—*Intsia bijuga.*

FIG. 27.—*Cassia nodosa.*

FIG. 28.—*Pterocarpus indicus.*

FIG. 29.—*Kingiodendron alternifolium.*

FIG. 30.—*Erythrina indica.*

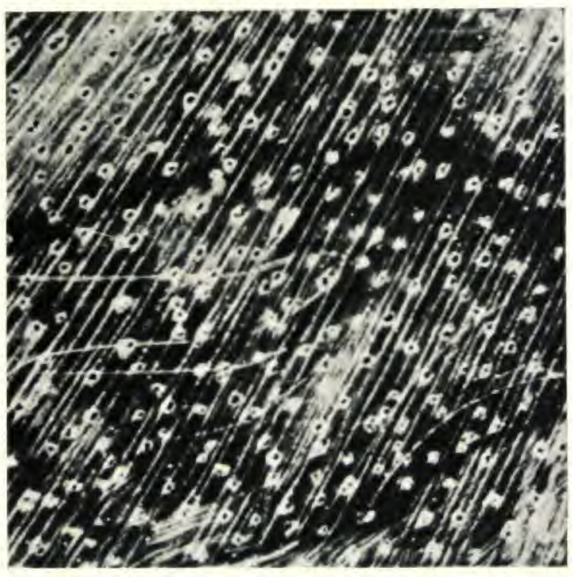

FIG. 31.—*Caesalpinia sappan.*

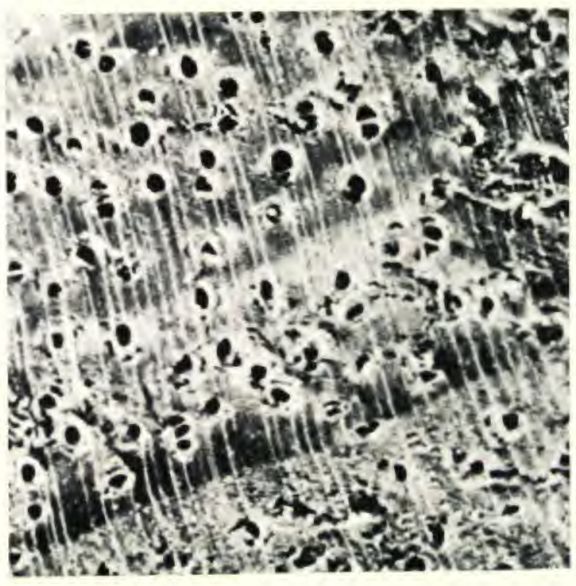

FIG. 32.—*Parkia roxburghii.*

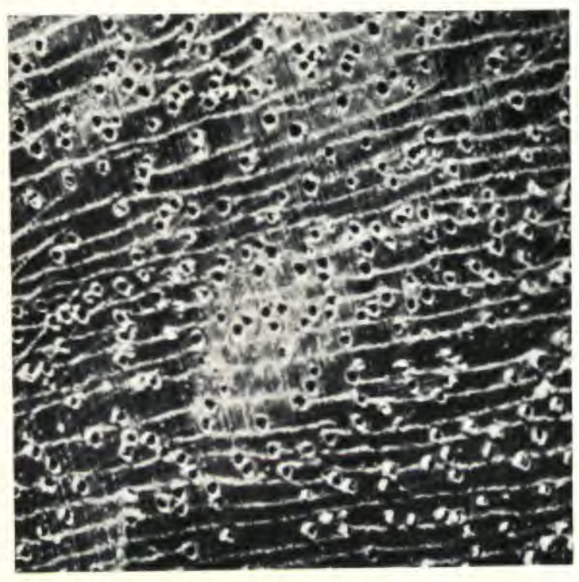

FIG. 33.—*Ixonanthes icosandra.*

FIG. 34.—*Chloroxylon swietenia.*

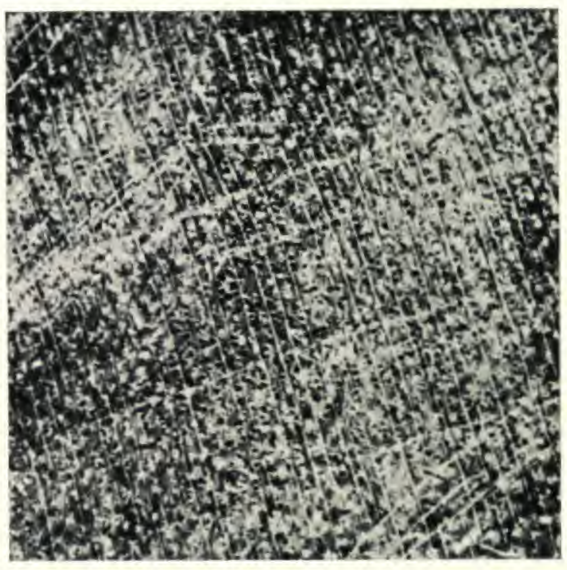

FIG. 35.—*Fagara integrifolia.*

FIG. 36.—*Murraya exotica.*

PLATE XXIV.

FIG. 37.—*Irvingia malayana.*

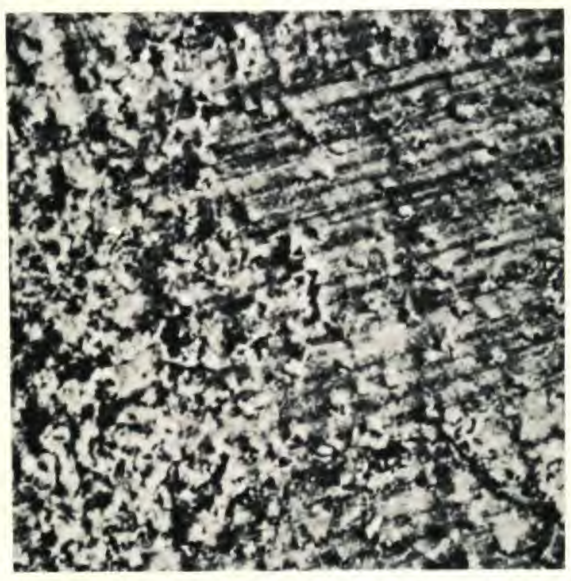

FIG. 38.—*Canaium commune.*

FIG. 39.—*Aglaia clarkii.*

FIG. 40.—*Amoora aherniana.*

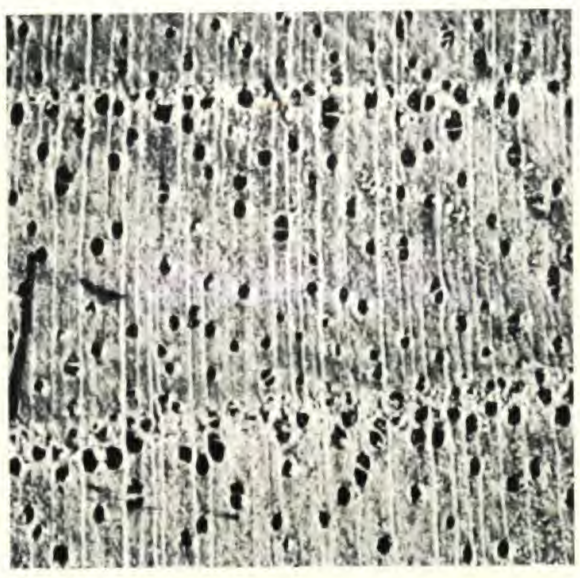

FIG. 41.—*Toona calantas.*

FIG. 42.—*Sandoricum indicum.*

FIG. 43.—*Xylocarpus granatum.*

FIG. 44.—*Bischofia javanica.*

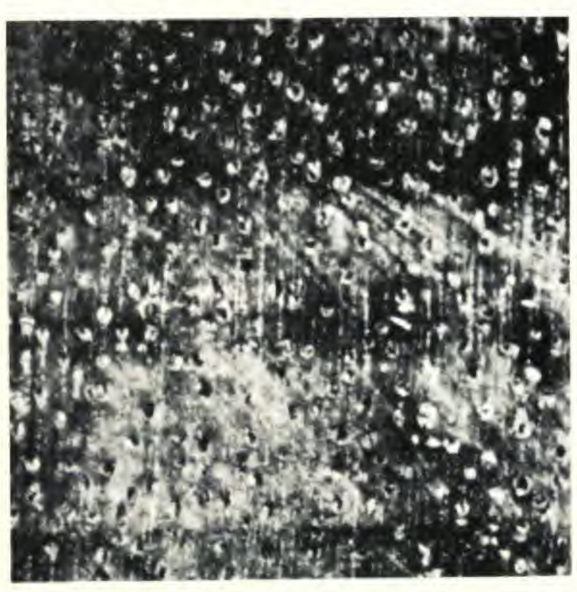

FIG. 45.—*Koordersiodendron pinnatum.*

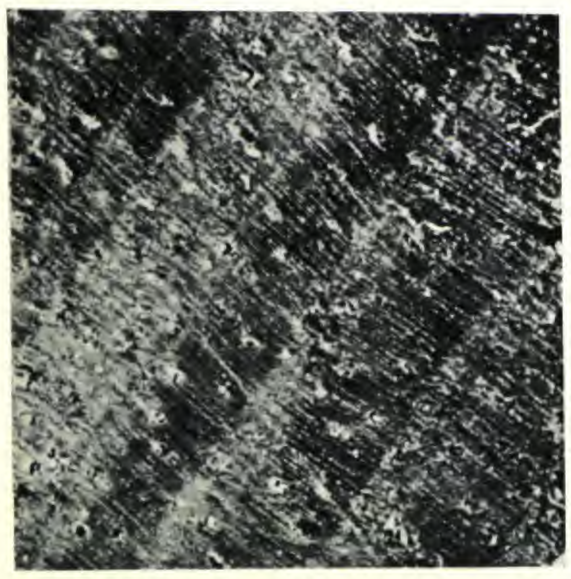

FIG. 46.—*Melanorrhoea* sp.

FIG. 47.—*Urandra* sp.

FIG. 48.—*Dodonaea viscosa.*

PLATE XXV.

FIG. 49.—*Euphoria cinerea.*

FIG. 50.—*Pometia pinnata.*

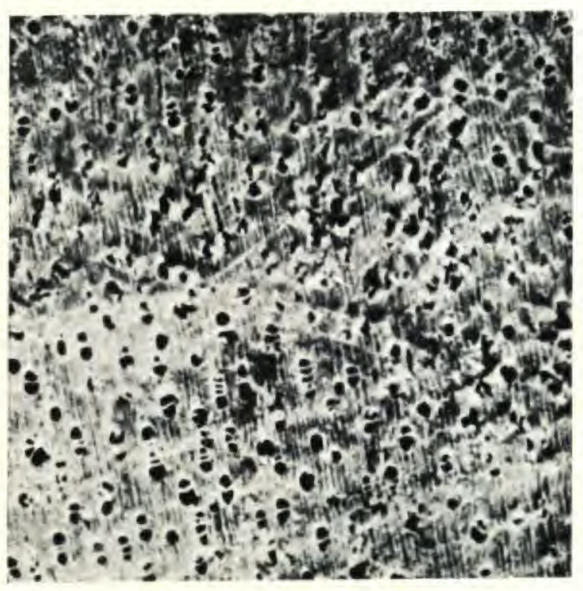

FIG. 51.—*Zizyphus zonulatus.*

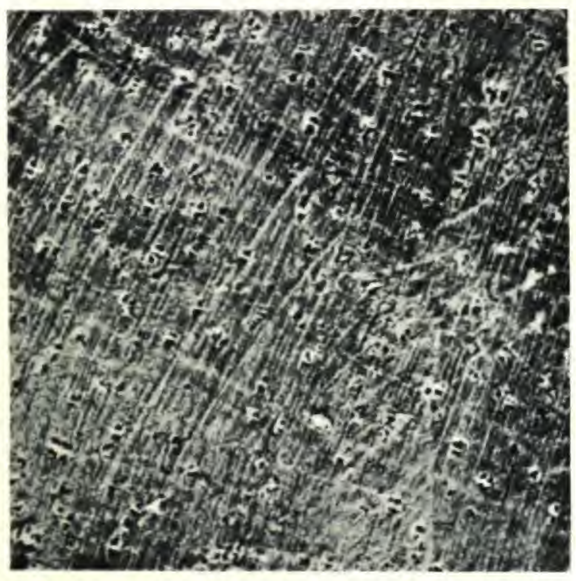

FIG. 52.—*Gonystylus bancanus.*

FIG. 53.—*Berrya ammonilla.*

FIG. 54.—*Bombycidendron campylosiphon.*

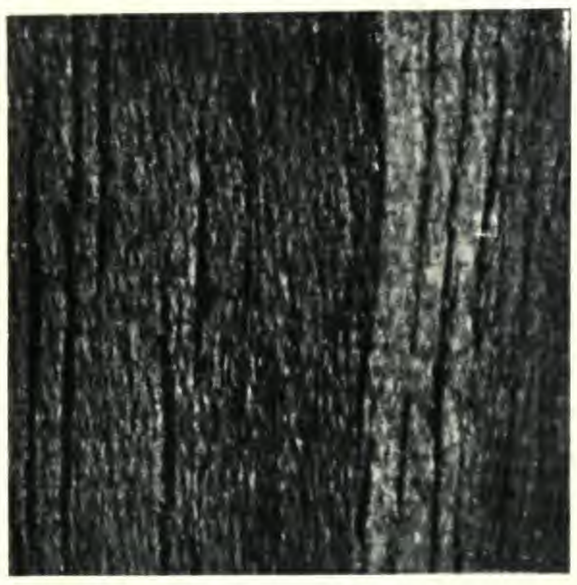

FIG. 55.—*Bombycidendron campylosiphon.*

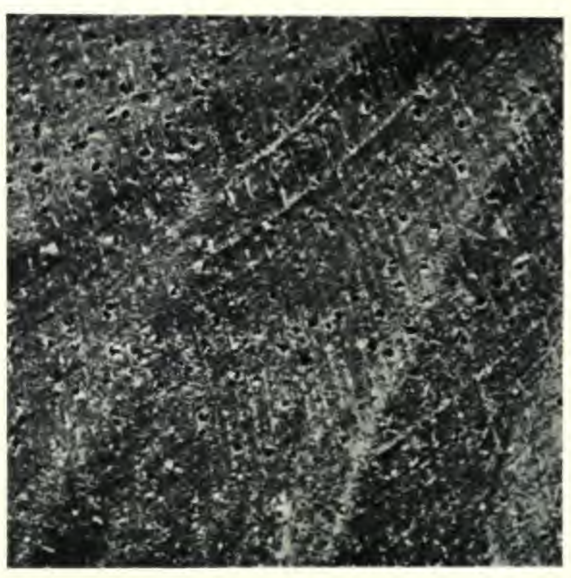

FIG. 56.—*Thespesia populnea.*

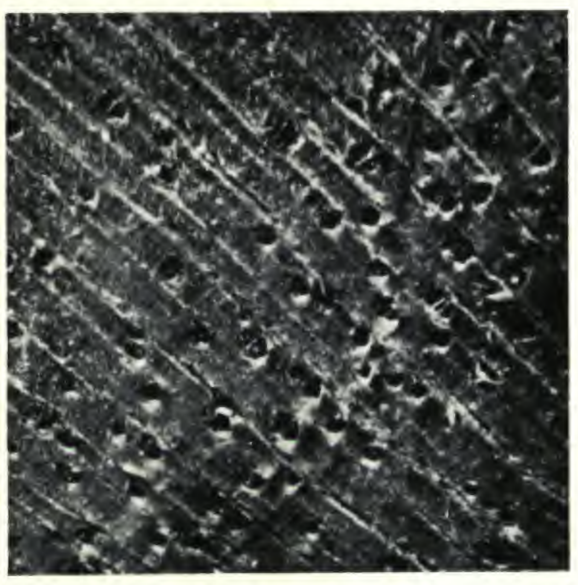

FIG. 57.—*Pterocymbium tinctorium.*

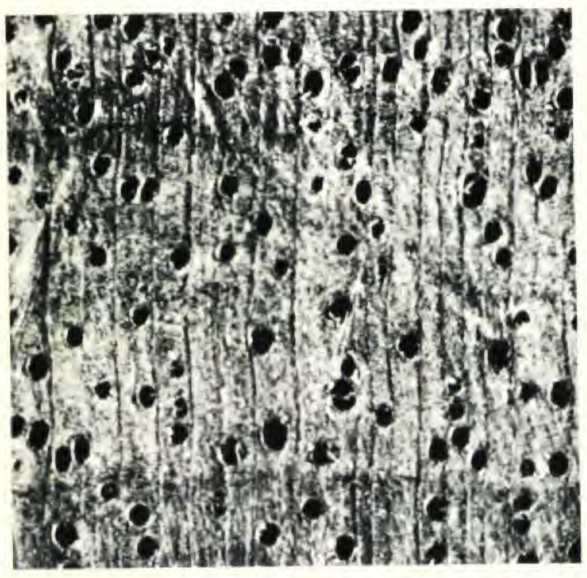

FIG. 58.—*Tarrietia javanica.*

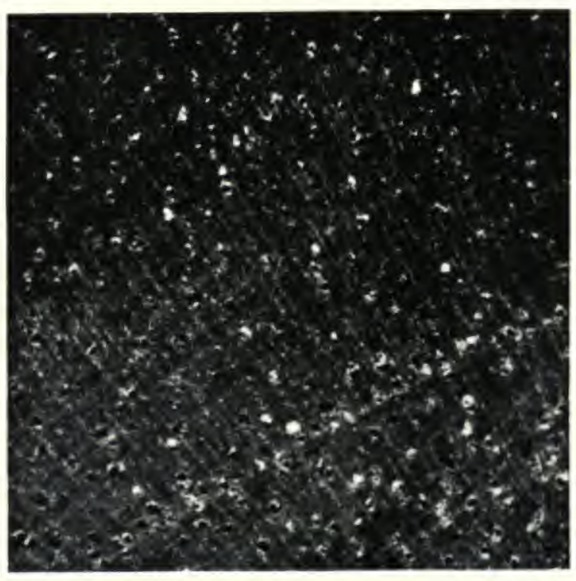

FIG. 59.—*Tarrietia sylvatica.*

FIG. 60.—*Dillenia* sp.

PLATE XXVI.

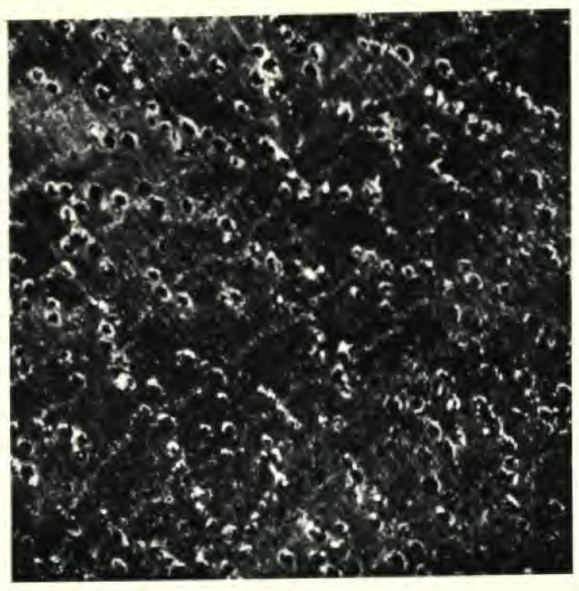

FIG. 61.—*Calophyllum inophyllum.*

FIG. 62.—*Calophyllum borneense.*

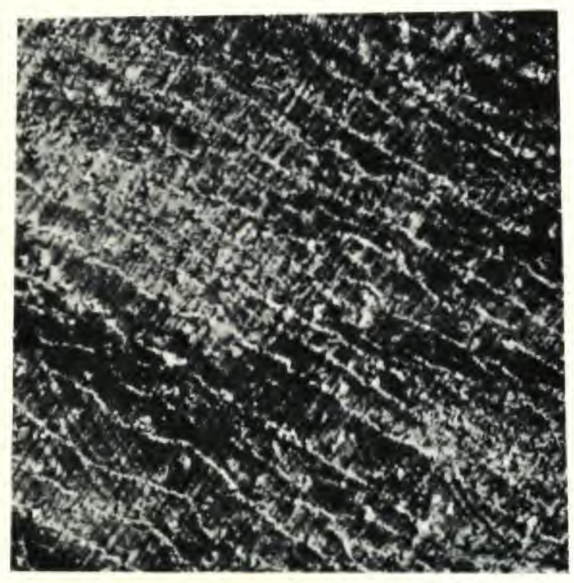

FIG. 63.—*Cratoxylon* sp.

FIG. 64.—*Mesua ferrea.*

FIG. 65.—*Vatica* sp.

FIG. 66.—*Balanocarpus* sp.

FIG. 67.—*Shorea balangcran?*

FIG. 68.—*Hopea acuminata.*

FIG. 69.—*Dryobalanops* sp.

FIG. 70.—*Shorea guiso.*

FIG. 71.—*Dipterocarpus grandiflorus.*

FIG. 72.—*Shorea polysperma.*

PLATE XXVII.

FIG. 73.—*Red lauan.*

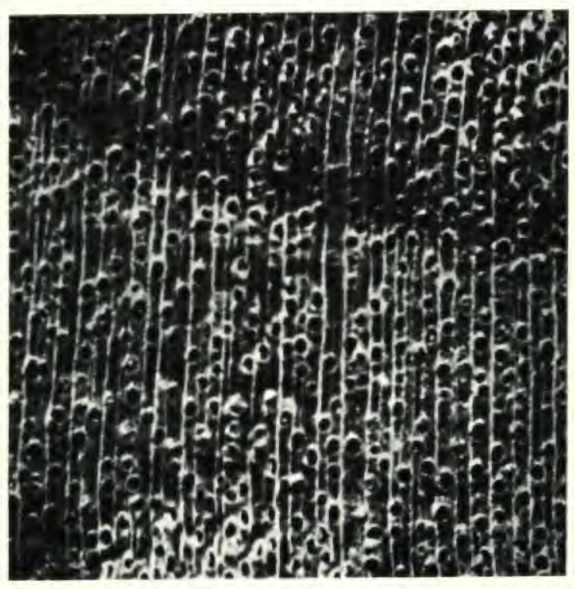

FIG. 74.—*Anisoptera* sp.

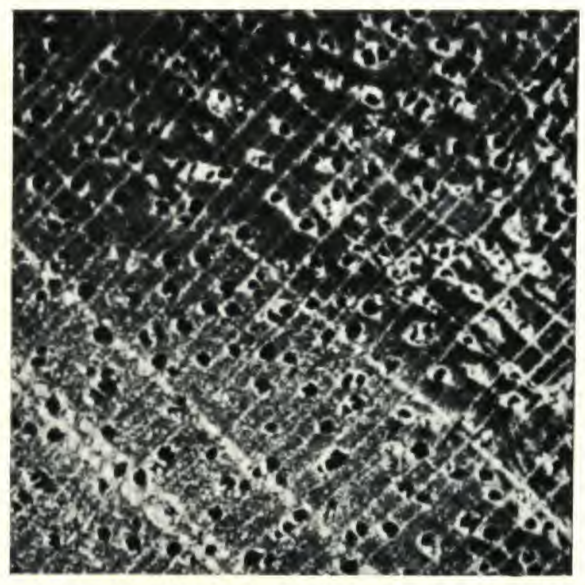

FIG. 75.—*White lauan.*

FIG. 76.—*Cotylelobium* sp.

FIG. 77.—*Cotylelobium* sp.

FIG. 78.—*Serial putch.*

FIG. 79.—*Homalium* sp.

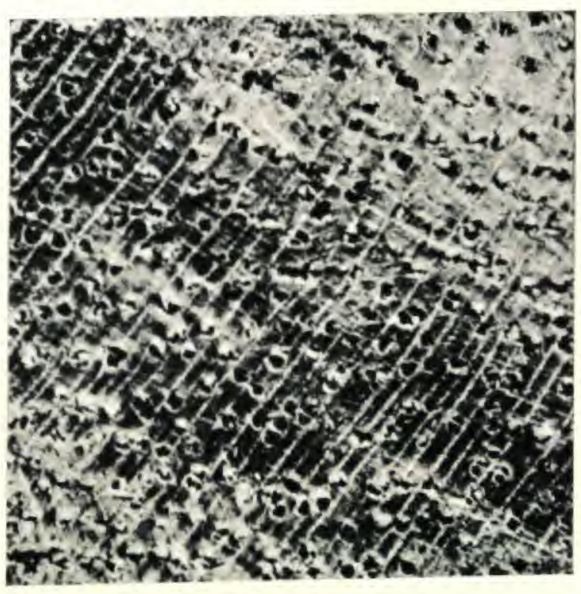

FIG. 80.—*Octomeles sumatrana.*

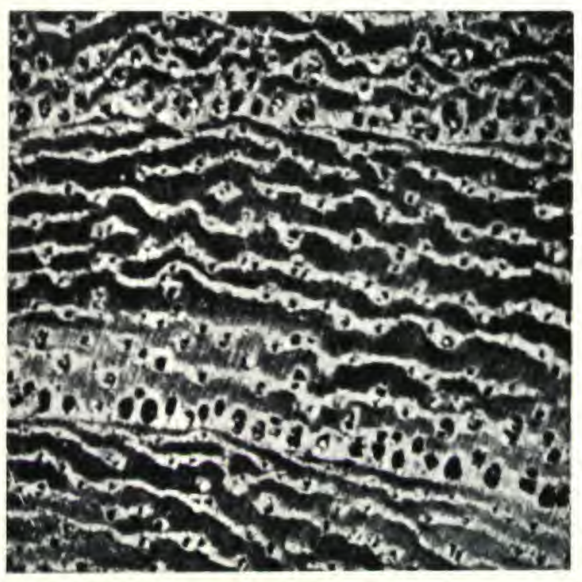

FIG. 81.—*Lagerstroemia speciosa.*

FIG. 82.—*Sonneratia pagatpat.*

FIG. 83.—*Carallia integerrima.*

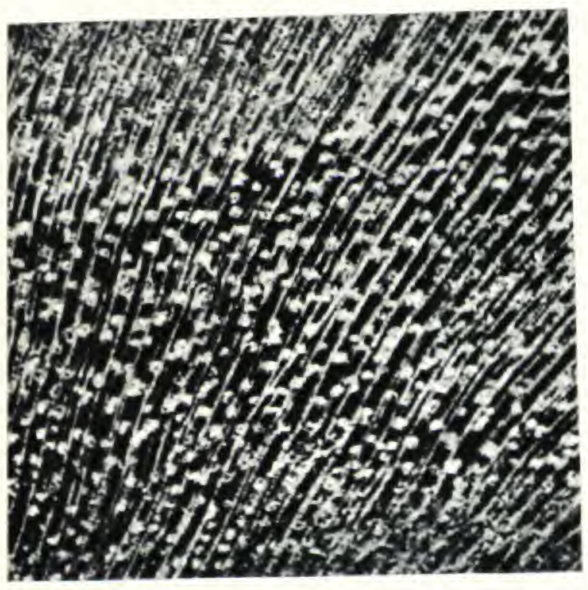

FIG. 84.—*Bruguiera gymnorrhiza.*

PLATE XXVIII.

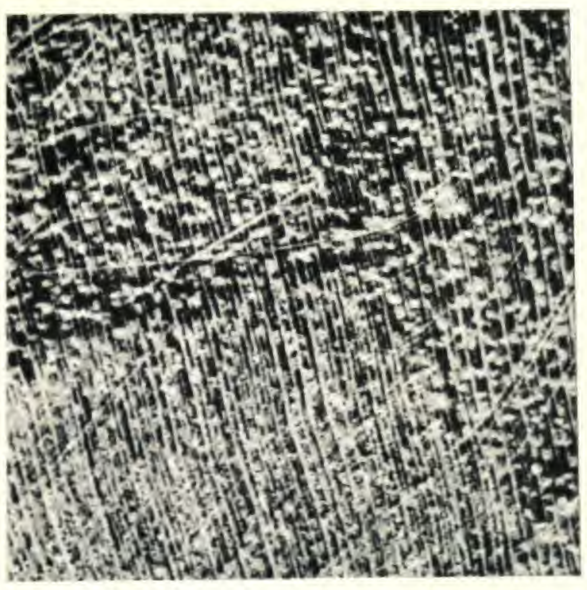

FIG. 85.—*Ceriops tagal.*

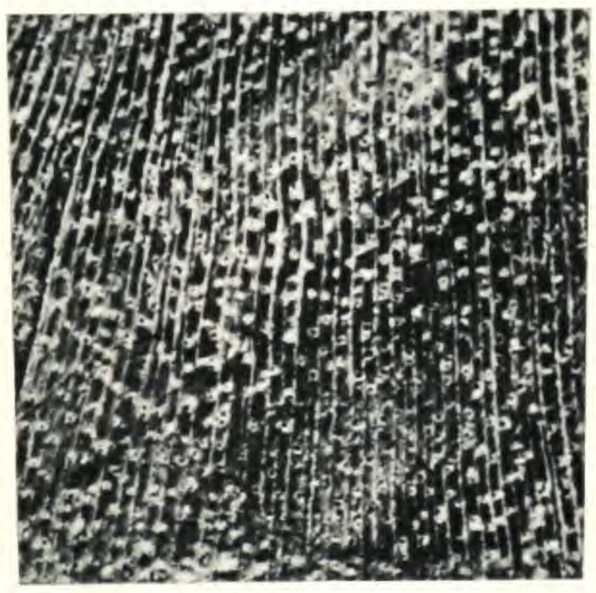

FIG. 86.—*Rhizophora* sp.

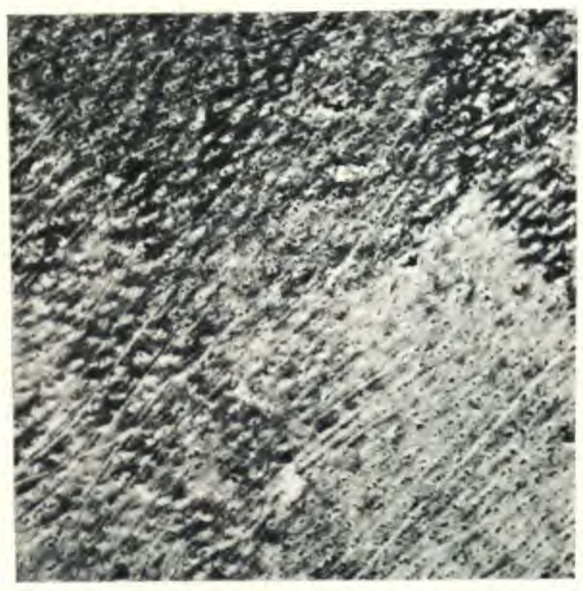

FIG. 87.—*Lumnitzera littorea.*

FIG. 88.—*Terminalia nitens.*

FIG. 89.—*Eugenia* sp.

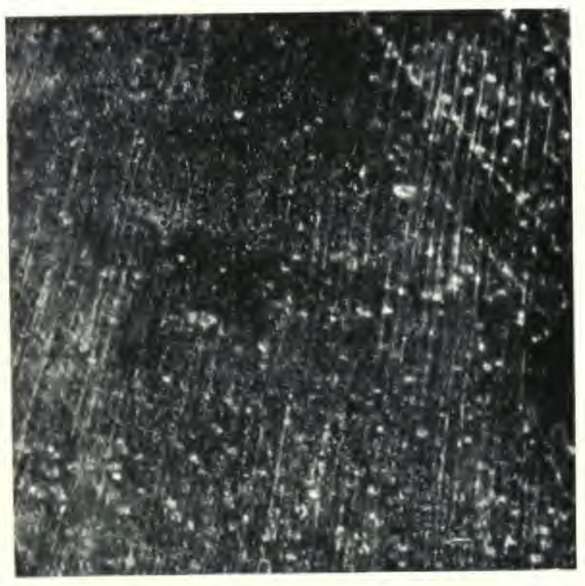

FIG. 90.—*Xanthostemon verdugonianus.*

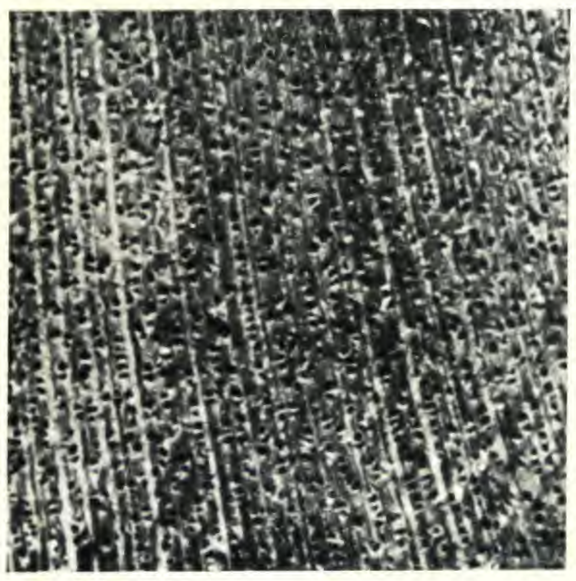

FIG. 91.—*Polyscias nodosa.*

FIG. 92.—*Aegiceras floridum.*

FIG. 93.—*Illipe betis.*

FIG. 94.—*Palaquium* sp.

FIG. 95.—*Maba buxifolia.*

FIG. 96.—*Fagraea* sp.

PLATE XXIX.

FIG. 97.—*Alstonia macrophylla.*

FIG. 98.—*Alstonia scholaris.*

FIG. 99.—*Dyera lowii.*

FIG. 100.—*Wrightia laniti.*

FIG. 101.—*Avicennia officinalis.*

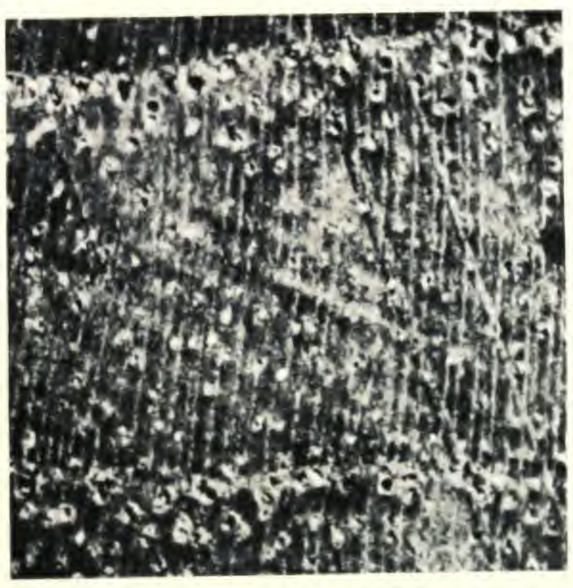

FIG. 102.—*Tectona grandis.*

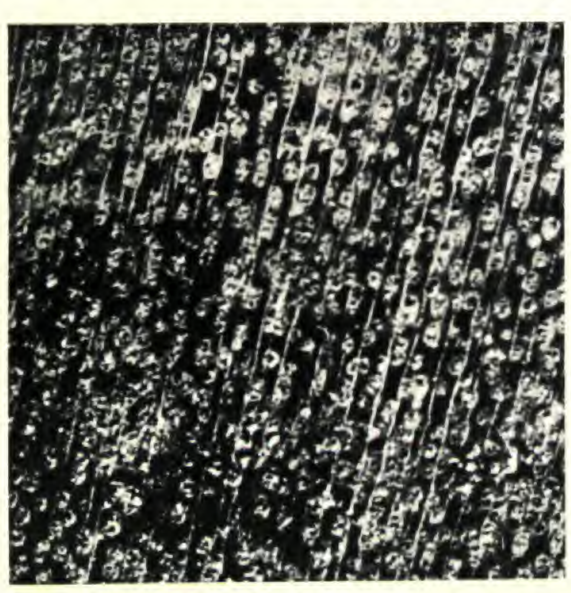

FIG. 103.—*Vitex aherniana.*

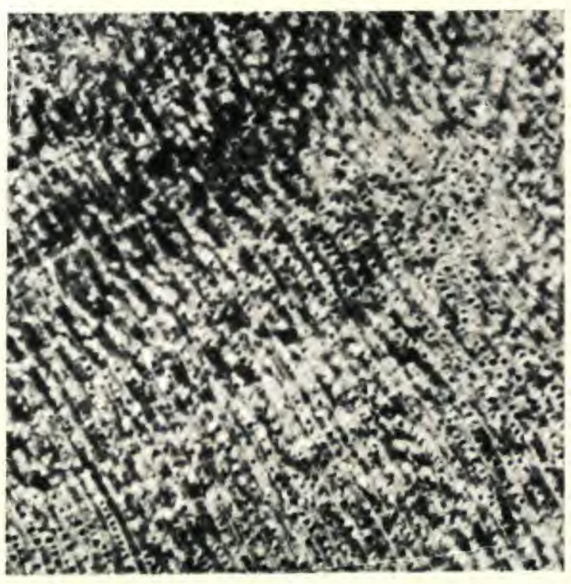

FIG. 104.—*Vitex littoralis.*

FIG. 105.—*Gardenia barnesii.*

FIG. 106.—*Nauclea* sp.

FIG. 107.—*Sarcocephalus cordatus.*

FIG. 108.—*Vernonia* sp.

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NOTES ON PHILIPPINE ORCHIDS WITH DESCRIPTIONS OF NEW SPECIES, I.*

By OAKES AMES.

(From the Ames Botanical Laboratory, North Easton, Mass., U. S. A.)

It has been suggested by Dr. Fritz Kränzlin that the species of *Dendrochilum* which I have assigned to the section *Acoridium* ought to constitute a distinct genus. Dr. Kränzlin asserts that the form of the labellum is quite distinctive in *Acoridium* on account of its likeness to the letter E. When I studied *Dendrochilum tenellum* in the preparation of Fascicle I of "Orchidaceae" I felt strongly that it belonged to a genus entirely distinct from *Dendrochilum* because of the absence of stelidia from the column and of the peculiar subfiliform leaves. Since then I have been convinced by a study of more material that *Acoridium* belongs to *Dendrochilum*. In the first place, the E-formed labellum on which Dr. Kränzlin lays emphasis is only characteristic of a majority of the species of the section *Acoridium* and is not found in *D. turpe, D. oliganthum, D. hastatum, D. Merrillii* and *D. ocellatum,* which clearly belong to the section. In the second place the lack of stelidia in the species of § *Acoridium* is not a wholly satisfactory differentiating character between it and § *Platyclinis*. It is not satisfactory because the lack of stelidia expresses a condition which is approached by well-defined species of *Dendrochilum* such as *D. palawanense* and because *D. Merrillii* in which the stelidia are absent from the column is in every other respect a well-marked species of *Dendrochilum* § *Platyclinis*. Furthermore, there is no habital distinction by which to separate the species of *Acoridium* from *Dendrochilum*. The linear leaf characteristic of *D. tenellum, D. sphacelatum*

* Proof corrected by E. D. Merrill and C. B. Robinson.

and *D. luzonense* passes into the broadly lanceolate leaves of *D. Merrillii* through such species as *D. graminifolium, D. tenuifolium, D. turpe* and *D. philippinense*. The calli on the labellum of *D. tenue, D. parvulum* and *D. venustulum* are not characteristic of *Acoridium* as a whole and consequently are worthless in the consideration of generic segregation. After eliminating the characters which I have named there is nothing further, in my opinion, which may be reasonably regarded in an attempt to form a distinct genus with the species of § *Acoridium*.

Through an unfortunate oversight on the part of Dr. Kränzlin, who completed the *Coelogyninae* for "Das Pflanzenreich," left unfinished by Dr. Pfitzer, the titles on my plates of *Dendrochilum* species were overlooked. These plates were practically duplicates of the set prepared for Fascicle II of "Orchidaceae," and were loaned to Dr. Kränzlin to facilitate his work on species which I had recently described. I believed that Dr. Kränzlin would understand from the legends on the plates that in my forthcoming volume *Acoridium* would be displaced by *Dendrochilum*. As it turned out Dr. Kränzlin failed to observe the change in my work indicated by the plates and as a result an unlooked-for controversy ensued in which Dr. Kränzlin insisted [1] that the plates loaned to him were inscribed with the generic name *Acoridium*. Here again Dr. Kränzlin erred, as a subsequent examination proved the correctness of my assertion to the effect that the loaned plates were inscribed with the generic name *Dendrochilum*. Dr. Kränzlin's work preceded mine, for which the plates were prepared, and consequently the changes in "Orchidaceae" Fasc. II, which were made at the end of the introduction were necessary. Dr. Kränzlin himself directed my attention to his unfortunate oversight.

DENDROCHILUM Bl.

D. (§ Acoridium) pulogense sp. nov.

Pseudobulbi congregati, pyriformes, in sicco rugosi plus minus 1 cm longi, juniores vaginis subacutis mox in fibras solutis inclusi. Folia acuta vel obtusa, linearia, 2–7.5 cm longa, circa 2 mm lata. Petiolus pergracilis. Pedunculus gracilis, filiformis, 4–10 cm longus. Bracteae inflorescentiae glumaceae, pedicellum brevem et ovarium multo excedentes. Inflorescentia laxiflora. Flores 6–10. Rhachis vix flexuosa. Sepala lanceolata, acuminata, acuta, 1-nervia, circa 3 mm longa plus minus 1 mm lata. Petala sepalis similia, ovata vel rotundata, valde acuminata, 1-nervia, 3 mm longa. Labellum 3-lobatum, lobi laterales membranacei semicrescentiformes, obtusi, lobus medius tridentatus. Calli 3, unus ad basim lobi lateralis utriusque, unus in medio partis saccatae labelli. Columna minuta, columnae *Dendrochili tenelli* similis.

This species is represented in the herbarium of the Bureau of Science by two collections, both of which were made by the same collectors on Mount Pulog.

[1] Orchis **2**: 78.

No. 16342 was found at an altitude of 2,500 m, and according to the notes made by the collectors had flesh-colored flowers. The foliage of no. 16347 is very variable, (only one plant of no. 16342 was found), so much so that at first glance two distinct species appear to be mingled. *Dendrochilum tenue* (Ames) Pfitzer and *D. parvulum* (Ames) Pfitzer are very close affinities of *D. pulogense.*

Mount Pulog, Province of Benguet, Luzon, January, 1909, *For. Bur. 16347* (type), *16342 Curran, Merritt & Zschokke.*

D. (§ Acoridium) auriculare sp. nov.

Pseudobulbi congregati, longitudinaliter rugosi, subpyriformes, circa 2 cm longi, juniores vaginis sŭbacutis mox in fibras solutis inclusi. Folium cum petiolo 1–2 dm longum. Lamina 6.5–13 cm longa, 1.5–2.7 cm lata, oblongi-lanceolata, acuminata, acuta vel subobtusa. Petiolus gracilis, 1.7–6 cm longus. Pedunculus subfiliformis, multo folium excedens, plus minus 2 dm longus. Bracteae inflorescentiae glumaceae, pedicellum brevem et ovarium multo excedentes. Flores in racemo laxo dispositi, albi. Sepala lateralia ovato-lanceolata, 3-nervia, 7 mm longa, 4 mm lata. Sepalum superius oblongum vel oblongi-ellipticum, 7 mm longum, 3.5 mm latum. Petala rotundato-elliptica vel rotundato-ovata, 6.5–7 mm longa, 4.5–5 mm lata, 3-nervia. Labellum 4.5 mm longum, 3-nervium, 3-lobatum; lobus medius subreniformis, lateralibus major, 3.5 mm longus; lobi laterales auriculares, 1.5 mm longi, inter eos in disco labelli callus magnus. Columna sectionis, circa 2 mm longa.

In general aspect *Dendrochilum auriculare* suggests *D. Hutchinsonianum* Ames, although analysis of the flowers shows clearly the differences between the two species. The lateral lobes of the labellum in *D. Hutchinsonianum* are distinctly linear-falcate, while in *D. auriculare* they are auriculate, much reduced in size and much shorter than the middle lobe (cf. Orchidaceae **2:** 96, *fig.*). *D. auriculare* is one of the largest-flowered species of the *Acoridium* section.

Province of Benguet, Luzon, December, 1908, Maximo Ramos, *Bur. Sci. 5818* (type). Mount Ugo, Province of Benguet, December 17, 1908, Maximo Ramos, *Bur. Sci. 5771.* Collector's note.—"The color of the flowers is nearly white."

D. venustulum (Ames) Pfitzer in Das Pflanzenreich **32** (1907) 116.

Mount Ugo, Province of Benguet, Luzon, December, 1908, Maximo Ramos, *Bur. Sci. 5840.* This species was originally described as *Acoridium venustulum* in the Proceedings of the Biological Society of Washington **19** (1906) 147 and later illustrated in Orchidaceae **2:** 88. It is apparently a rare species as the specimens gathered by Ramos are the only ones, with the exception of the type material, which have been collected for the Bureau of Science.

D. philippinense (Ames) Pfitzer in Das Pflanzenreich **32** (1907) 118.

A very odd form of this species has come from the Lusod-Bayabas trail, Province of Benguet, Luzon, which appears to have smaller flowers than the type. At first I felt no little hesitation in identifying the plants as *D. philippinense.* As all the racemes examined exhibit the peculiarity referred to I have prepared the following description.

Lateral sepals lanceolate, acuminate, acute, about 3.5 mm long, 1.5 mm wide; upper sepal oblong, acute, 3 mm long, about 1 mm wide. Petals acute, 3 mm long, 1.75 mm wide. Labellum 3-lobed, the lateral lobes equaling the middle lobe, linear falcate, about 1 mm long, middle

lobe broader than the laterals, middle lobe oblong, rounded, acute at the apex, 1 mm long, 0.75 mm wide. At the base of each lateral lobe there is a minute rounded callus. Column typical of the section.

The flowers are fleshy and most difficult to dissect as the sepals and petals break under very slight pressure. The labellum is thick and has a conduplicate middle lobe. No comments by the collectors have been made regarding the color of the flowers but in dried specimens those near the base of the raceme are brownish with the labellum yellow, those near the apex yellow. Although the racemes appear to be perfectly normal, flowers have the appearance of keeping partly closed so that even the old ones look like buds. The texture of the flowers is extraordinary and unlike that of any other known species of the genus from the Philippine Islands.

Province of Benguet, Luzon, December 16, 1908, altitude 2,000 m, *For. Bur. 15763 Curran & Merritt.*

D. ocellatum (Ames) Pfitzer in Das Pflanzenreich 32 (1907) 117.

This species, the type of which is represented by a small plant in the herbarium of the Bureau of Science, has been again collected by Bacani. The flowers exhibit the same hyaline dots from which the specific name was derived. These dots are in the form of minute protuberances which give the sepals and petals a verruculose character. According to the collector's notes the flowers are brown.

In the top of a mango tree, Lusod, Province of Benguet, Luzon, December 14, 1908, *For. Bur. 15908 Bacani.*

D. bicallosum Ames Orchidaceae 2 (1908) 117.

This species was originally collected in Mindoro by Elmer D. Merrill at an altitude of about 950 m on Mount Halcon. On October 23, 1907, Curran and Merritt obtained material in Laguna Province, Luzon, which I unhesitatingly refer to *D. bicallosum.* The leaves of several of the specimens from Luzon are longer and broader than those of the Mount Halcon plants, in several being nearly 2 dm long and 5 cm wide. Otherwise there are no conspicuous differences although the plants from Luzon are more luxuriant, a character which may be accounted for by more favorable conditions for growth.

Mount Maquiling, Laguna Province, Luzon, at an altitude of 550 m, in ridge forest; flowers brownish-yellow, October 23, 1907, *For. Bur. 7797 Curran & Merritt.*

D. pumilum Reichb. f. Bonplandia 3 (1855) 222.

Specimens which agree almost perfectly with the Cuming plant in the herbarium of the British Museum of Natural History numbered 2102, the number on which Reichenbach f. founded *D. pumilum*, have been collected in Laguna Province, Luzon, by Curran and Merritt. *Dendrochilum pumilum* is placed among the doubtful plants in the Pfitzer-Kränzlin monograph in Engler's "Pflanzenreich" without reference to the specimen of the type number in the British Museum. From my studies I have been unable to discover any sufficient reason for a total disregard of the evidence which this specimen furnishes. An interesting sidelight on the subject is supplied by a single plant in the Gray Herbarium which was collected in the Philippines by the Wilkes Expedition. This plant is inadequate for a sure diagnosis although it clearly belongs to *Dendrochilum* and is probably conspecific with *D. tenue* Pfitzer. In Reichenbach's handwriting it has been referred with a query to *Dendrochilum pumilum!* Together with Reichenbach's original description and the specimen in the British Museum, the

specimen in the Gray Herbarium seems to me to be of very great interest and value.

Mount Banajao, Laguna Province, Luzon, very common on trees, flowers yellowish-green, November 10, 1907, H. M. Curran and M. L. Merritt, *For. Bur. 8019;* at an altitude of 2,000 m, November 10, 1907, Curran and Merritt, *For. Bur. 8034;* at an altitude of 1,400 m, November 10, 1907, Curran and Merritt, *For. Bur. 8023, 8021.*

D. strictiforme (Ames) Pfitzer in Das Pflanzenreich 32 (1907) 116.

This species was first discovered by Elmer D. Merrill between Suyoc and Pauai in Benguet Province. The present specimen was collected in Laguna Province.

Mount Banajao, Laguna Province, Luzon, at an altitude of 1,400 m, flowers white, November 1, 1907, H. M. Curran & M. L. Merritt, *For. Bur. 8024.*

D. cinnabarinum Pfitzer in Das Pflanzenreich 32 (1907) 104; Ames Orchidaceae 2: viii; 3: 10, *pl. 27, II, B, b.*

This very interesting species of the *Dendrochilum pumilum* group has again been found. Messrs. Curran, Merritt and Zschokke collected specimens at an altitude of 2640 m, January 5, 1909, on Mount Pulog, Province of Benguet, Luzon, *For. Bur. 16348.* Until the rediscovery of the species *D. cinnabarinum* was only known through the specimens gathered in Benguet by A. Loher (no. 461).

CESTICHIS Pfitzer.

C. nutans sp. nov.

Pseudobulbi 3 cm longi, pyriformes. Folia oblonga, acuta; 3 dm longa, 2–3 cm lata. Sepala 7 mm longa, 3 mm lata. Petala linearia, 7 mm longa, 0.5 mm lata. Labellum cuneato-flabellatum, 8 mm longum, prope apicem 8 mm latum, callo ad basim. Columna arcuata, 6 mm longa.

C. nutans is a robust species, allied to *C. Merrillii,* with oblong acute leaves which are considerably longer than the winged scape. The raceme is slender and nutant. The flowers according to the collector's notes are brick-red. The labellum is cuneate-flabellate in outline, 2 mm wide at the base, and near the point of union with the column very fleshy, and somewhat channelled.

Camp Keithley, Lake Lanao, Mindanao, May 1907, *Mary Strong Clemens s. n.:* Province of Surigao, April 6, 1906, *F. H. Bolster 289.* Here also belongs the plant collected on Mount Victoria, Island of Palawan, in March, 1906, by F. W. Foxworthy, *Bur. Sci. 638.*

ANGRAECUM Thou.

A. philippinense Ames in Philip. Journ. Sci. 2 (1907) Bot. 336; Orchidaceae 2: 246; 3: 69, *pl. 50.*

This species which was originally collected on Mount Halcon by E. D. Merrill, has been found at Imogen, Province Nueva Viscaya, Luzon, where H. M. Curran collected specimens on December 22, 1908, *For. Bur. 10860.* The flowers of the plant collected by Curran have spurs or nectaries about 10 cm long. A comparison between the plants from Luzon and those from Mindoro clearly proves that the spur of the type was not fully developed on the date of collection. This statement is sufficient to account for the discrepancy between the measurements given above and those published in the original description. It is a well established fact that the spurs in orchids increase in length as the flowers

develop. This characteristic is frequently misleading and not unlikely to cause confusion. The leaves of the specimens from Luzon measure 6.5 cm in length and 1.5 cm in width.

The collector's notes state that the plants were found at an altitude of 1,400 m and that the flowers are white and fragrant and very ornamental.

DENDROBIUM Sw.

D. hymenanthum Reichb. f. in Bonplandia 3 (1855) 222; Walpers Annales Botanices Systematicae 6: 302.

This very rare species which was among the novelties secured by H. Cuming (no. 2135) in the Philippine Islands has been twice collected by the botanists of the Bureau of Science. It is closely related to *Dendrobium Micholitzii* Rolfe (cf. Ames Orchidaceae 1: 41, *pl. 11*). The stems are yellow, about 8 cm long, quadrangular, very slender, bifoliate at the summit, with the oblong-elliptic leaves 2–3.5 cm long, 8 mm wide. The flowers, which are borne at the summit of the stem, are fragrant; the mentum is tinged with "purple" outside. Pedicels slender, subfiliform, about 2 cm long. Lateral sepals triangular, acute, prolonged into a stout, curved, obtuse mentum; from tip of sepals to tip of mentum 16 mm long. Upper sepal lanceolate, 7 mm long. Petals similar to the upper sepal, but narrower, 5 mm long. Labellum about 2 cm long, somewhat oblanceolate, dilating gradually from the cuneate base to the rounded, 7 mm wide apex; near the apex is a small crest of short, yellowish hairs.

The director of the Royal Botanic Gardens at Kew has very kindly compared my material with the Cuming specimen preserved in the Kew Herbarium and has assured me that the specimens collected by Ramos are conspecific with the Cuming plant.

Montalban, Province of Rizal, Luzon, W. Schultze, May, 1908, *Bur. Sci. 5610;* Maximo Ramos, July 29, 1907, *Bur. Sci. 3035.* According to Ramos the flowers last a very short time.

NOTE.—From an excellent photograph which accompanies the plants collected by Ramos it appears that the flowers are produced singly at the summit of the stem.

D. epidendropsis Kränzlin in Orchis 2 (1908) 79, *fig.*

The material which I have identified as *D. epidendropsis* was collected by W. S. Lyon (no. 118). Although a native of the Philippine Islands the exact locality from which Mr. Lyon's plant came is not known. Mr. Lyon flowered it in his garden in November, 1908. He described the flowers as greenish-yellow, coriaceous in texture, wax-like, and both within and without glossy as if varnished. A single leaf, and what appears to be an undersized stem and three flowers constitute the specimen at hand. The leaf is oblong-lanceolate, 7 cm long, 1.5 cm wide, subcoriaceous. The stem is fusiform, clothed with several scarious sheaths, at the summit is a short raceme, 2 cm long, which bears three 3 cm long flowers. The flowers are conspicuous because of the long subfalcate mentum which is 2 cm long and about 3 mm in diameter.

In the herbarium of the Bureau of Science there are three specimens which agree with my interpretation of *Dendrobium epidendropsis.* Two of these were collected on Mount Mariveles, Province of Bataan. The third specimen was taken in the Province of Rizal.

Lamao River, Mount Mariveles, Province of Bataan, Luzon, growing on trees on exposed ridges, at an altitude of 900 m, flower odorless, lip bright, pale-green, petals pale-green with 3 or 4 brown stripes from base to tip, December 10, 1904, T. E. Borden, *For. Bur. 2109;* near same locality, on trees, flowers yellow with

a tinge of red, November, 1904, *A. D. E. Elmer 6839:* Province of Rizal, Luzon, November 23, 1907, Maximo Ramos, *Bur. Sci. 3060.*

NOTE.—The specimens collected by Elmer and Borden have stems up to 2 dm long and narrowly lanceolate leaves, 1.3 dm long, 1–1.9 cm wide. The flowers of the specimen collected by Elmer are, in a dried state, strongly tinged with purple and resemble large flowers of *Dendrobium secundum*. The racemes on all the specimens examined appear to have been few-flowered.

D. Dearei Reichb. f. in Gard. Chron. 52 (1882) 361.

MINDORO, January, 1908, *For. Bur. 8525 Merritt.*

D. (§ Aporum) Merrillii Ames Orchidaceae 2: 181, *fig.*

In Orchis 2: 96, Dr. Kränzlin in a review of "Orchidaceae Fasc. II," criticises rather severely my description of *Dendrobium Merrillii* and suggests that to me the genus *Dendrobium* is a *seven-sealed book*. His reason for this unkind remark is based on the words "Folia . . . conduplicata, explanata 14 mm lata." By these words he understands that *D. Merrillii* is a species with broad leaves and consequently inadmissible as a member of § *Aporum*. Unfortunately the word "explanata" is misleading, although it was intended to indicate that the leaves if spread out would then measure 14 mm in width. As a matter of fact the leaves are characteristic of § *Aporum* and resemble the leaves of such species as *D. atropurpureum* Miq. and *D. sagittatum* J. J. Smith. In his criticism Dr. Kränzlin has quoted from my description and has omitted the word "conduplicata" which I thought was a sufficient offset to the problematical condition expressed by "explanata." The leaves of *D. Merrillii* are in reality equitant and in the type measure 7 mm across in the vertical direction of the stem.

BULBOPHYLLUM Thou.

B. bataanense Ames Orchidaceae 1: 96.

Among living plants sent from Mount Mariveles this species bloomed in May, 1909, in my greenhouse. The flowers are yellowish, faintly tinged with purple and conspicuously nerved with pale-green. The sepals, especially the upper one, are sprinkled with fine purple dots. The labellum is similarly marked with the addition of a bright yellow spot at the base of the cordate apical portion. The original description of this species was prepared from dried material, consequently the color of the flowers could not be given accurately.

Mount Mariveles, Province of Bataan, Luzon, *Elmer D. Merrill*, 1905.

PHALAENOPSIS Bl.

P. Lindenii Loher in Journ. des Orch. 6 (1895) 103.

Among the orchids collected by W. S. Lyon is a specimen of *Phalaenopsis* which is surely conspecific with *P. Lindenii*. It agrees in every detail with the description published in "Le Journal des Orchidées." *P. Lindenii* is described as resembling *P. Schilleriana* in its foliage and as having flowers which suggest those of *P. rosea* (*P. equestris*). Mr. R. A. Rolfe has suggested that Mr. Loher's species may be a natural hybrid resulting from a cross between *P. Schilleriana* and *P. rosea* which would give *P. Veitchiana* Reichb. f. The specimen at hand is not at all in agreement with *P. Veitchiana* as figured and described in horticultural literature. The flowers are about 2.5 cm in diameter and the apical lobe of the labellum is rotund apiculate, 1 cm long by 8 mm wide. The lateral lobes are oblong, obtuse, somewhat dilated at the apex, about 7 mm long, the fleshy callus between the lateral lobes is disc-shaped when spread out. The lateral sepals are somewhat ovate-falcate, 13 mm long, 7 mm wide. The petals are spathulate, obtuse, 16 mm long, 6 mm wide.

Mr. Lyon says that the flowers are very persistent. According to his notes the anterior surface of the column and the lip are rich-purple, otherwise the perianth is light-rosy-purple, each segment marked with seven well defined lines, those on the lip continuous or uninterrupted, those on the sepals and petals broken or formed by dots. The leaves are mottled gray and green and are almost identically like those of *Phalaenopsis Schilleriana* in coloration.

In addition to Mr. Lyon's specimen I have studied three others from the Philippines which I do not hesitate to refer to *P. Lindenii*. Two of these are in the herbarium of the Bureau of Science, the third in the herbarium of the New York Botanical Garden. All of these were collected in Benguet Province, Luzon. The specimen in the New York Botanical Garden collection has larger flowers than the others, these being about 3 cm across, with the rotund apical lobe of the lip about 1.3 cm long by 1.2 cm wide. The tip of the lip is in no way divided and is not at all in agreement with the lip of *P. Veitchiana* as represented in *plate 213* of the Floral Magazine. Until more material has been studied it seems best to adopt Mr. Loher's name for this *Phalaenopsis*. The specimens in the herbarium of the Bureau of Science have a branched inflorescence not unlike that of *Ionopsis utricularioides* Lindl. in general aspect, although much stouter. In Orchis (**1**: 82, *fig. 37*) this species has been very fully illustrated. The analysis of the flowers is very detailed.

Baguio, Province of Benguet, Luzon, August 24, 1906, H. M. Curran, *For. Bur. 5121, 5122,* flowers light-pink and white; October 21, 1904, R. S. Williams (no. 1947 bis) in hb. New York Botanical Garden; W. S. Lyon (no. 39).

NOTE: Mr. Lyon says the plant is called *P. Lindenii* at Manila.

AERIDES Lour.

A. Lawrenceae Reichb. f. Gard. Chron. N. S. **20** (1883) 640, 307, 368.

In Orchidaceae **2**: 249, I listed this species, basing my conclusions on a specimen collected by the Rev. R. F. Black in Mindanao. This specimen was fragmentary and my identification was in a way provisional. Another specimen has come to hand from W. S. Lyon which is undoubtedly *A. Lawrenceae*. The flowers are large, about 2.5 cm in diameter and very ornamental. Unfortunately Mr. Lyon forgot the exact locality from which he obtained his specimens which flowered in his garden at Manila.

Philippine Islands, *W. S. Lyon 25.*

HABENARIA Willd.

H. Leibergii Ames Orchidaceae **2**: 34, *fig.*

This species has been collected in Rizal Province by D. LeRoy Topping who found specimens in July, 1908. The type was discovered by J. B. Leiberg on Mount Mariveles in 1904. One of the specimens found by Topping shows an interesting variation from the type in its larger leaves which measure nearly 1 dm in length and 4–5 cm in width. On this luxuriant form the flowers are in a dense raceme, about 20 in number.

Montalban, Rizal Province, Luzon, July, 1908, *Bur. Sci. 5226 Topping.*

NOTES ON PHILIPPINE PALMS, II.

By O. Beccari.

(*Florence, Italy.*)

ARECA Linn.

Areca macrocarpa Becc. sp. nov.

Inter majores. Folia ampla, 2.5 m longa, petiolo brevissimo crasso; segmentis numerosis aequidistantibus, valde approximatis, lanceolato-falcatis, valde acuminatis, 1-costulatis et 5 cm latis, vel 2-costulatis et subduplo latioribus; majoribus 1 m et ultra longis, superioribus sensim decrescentibus, terminalibus in flabellum non unitis. Spadices . . . . Fructus majusculi, 7 cm longi, ovoideo-elliptici, perianthio 16–17 mm alto suffulti, in medio 5 cm lati, utrinque fere aequaliter attenuati, superne conici, apice mammillaeformi et areola 5 mm lata terminati; semine e basi plana conoideo, apice obtuso, 28 mm longo, 22 mm lato.

A rather large palm, apparently of the dimensions of *A. Whitfordii*. *Leaves* large, 2.5 m long in one specimen, its petiolar part very short, strongly arched, 5 cm broad near the lowest leaflets, slightly concave above, rounded beneath; the rachis is broadly channelled above in its first or basal portion and prominently so in the median portion, and has an acute, salient angle along its center; leaflets very numerous, equidistant, very close together, almost imbricate and inserted at an acute angle, lanceolate-falcate, long-acuminate, 1-costulate and 5 cm broad, or 2-costulate and about twice as wide, the largest, those of the middle, 1 m long, and at times more; the upper gradually shorter, the ultimate ones being the smallest and not united to form a flabellum. *Spadices* . . . . *Fruits* large, ovoid-elliptic, 7 cm long, 5 cm in diameter in the middle, and thence gradually, and almost equally diminishing toward both ends, tapering at the apex to a conical point which terminates in an almost flat surface, about 5 mm in diameter. Seed conoidal, 28 mm long, 22 mm broad, having a truncate or flat base, and a blunt point; the branches of the raphe are much anastomosed and form a close net all around the seed. *Fruiting perianth* 16 to 17 mm high, with thick, coriaceous, subdeltoid, acute sepals; the petals have a triangular dead point, sharply defined from the lower living part.

Mindanao, District of Zamboanga, Port Banga, *For. Bur. 9103 Whitford & Hutchinson*, January, 1908.

Of this fine and large *Areca*, I have seen only one entire leaf, and a few fruits; these latter are even larger than those of *A. Catechu;* in fact no other species of the genus is known with such large fruits. Otherwise it seems related to *A. Whitfordii*.

Areca mammillata var. **mindanaoensis** Becc. var. nov.

Differs from the typical forms growing in Palawan, especially by its fruits, which are considerably larger. It is a plant about 4 m high. *Leaves* in one specimen 1.4 m long in the pinniferous part with a petiolar part 25 cm in length; the leaf-sheath is 22 cm long. *Stem* 3 cm in diameter. Leaflets about 28 on each side, equidistant, 30 to 35 cm apart, 1-costate, but occasionally 2-costate, narrowly falcate, the intermediate ones 45 to 50 cm long, 18 to 20 mm broad, otherwise as in the type, the two terminal leaflets form a small, forked flabellum, are 4- or 5-costulate, and terminate with as many pairs of rather obtuse teeth as there are costae, these are, however, more acute than in the type. *Fruits* larger than in the type, very narrowly oblong-ellipsoid, diminishing a good deal toward both ends, about 3 cm long, 9 mm in diameter. *Seed* 13 mm long, 6.5 mm broad. *Fruiting perianth* 12 mm high.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9141 Whitford & Hutchinson*, in forests at about 20 m above sea level, December, 1907.

PINANGA Bl.

Pinanga geonomaeformis Becc. sp. nov.

Gracillima, sobolifera, 1.5 m alta, caudice tenuiter arundinaceo. Folia in circumscriptione oblonga, 25–35 cm longa, 11–12 cm lata, irregulariter et interrupte in segmentos paucos, utrinque 1–2, pinnatisecta; segmentis lateralibus e basi lata sensim in acumen falcatum attenuatis; inferioribus angustis, 1- vel 2-costulatis, superioribus 3–7-costulatis et 3–6 cm latis, duobus terminalibus in flabellum profunde furcatum unitis et in margine exteriore inciso-dentatis. Spadix gracillimus, indivisus, 10–16 cm longus; fructibus concinnis, exacte biseriatis, angustissimis, teretibus, saepe curvulis, 13–14 mm longis, 3 mm crassis, perianthio depresse cupulari, 3 mm lato, 1.5 mm alto, truncato et ad faucem paullo coarctatum suffultis.

A very delicate and elegant palm 1 to 1.5 m high, growing in small clusters. *Stems* very slender, 7 to 10 mm in diameter, very distinctly ringed every 3 to 6 cm; internodes slightly clavate, dotted with small orbicular tobacco-colored scales. *Leaves* pinnatisect; the leaf-sheaths finely striate and dotted like the stems and with the remains of a deciduous membranaceous ligule at their mouths; the petiole slender, 6 to 8 cm long, 2.5 to 3 mm thick, this, and the rachis are also dotted with scales; the blade is oblong, 25 to 35 cm long, 11 to 12 cm broad, thinly papyraceous, dull, and about the same color on both surfaces, irregularly and interruptedly divided down to the rachis, into a very few, unequal, alternate or decurrent segments (2 to 4 on each side), which gradually narrow from a broad base to a falcate and acuminate point; the lowest

leaflets are small, narrow and 1- or 2-costulate, those of the middle are 3 to 6 cm broad and with 3 to 7 costae, the two of the apex are more or less cleft, and acutely toothed on their upper outer margin and are united by their bases but rather divaricated, so as to form a deeply forked flabellum with a wide reëntering angle between them. *Spadix* very simple and consisting of the very flattened axis or rachis, 10 to 14 cm long, more or less pedicellate, recurved when in fruit. *Male flowers* comparatively large for the small size of the plant, irregularly angular, 10 to 12 mm long; the calyx very small; the segments of the corolla falcate, very acuminate. *Fruiting perianth* shallowly cupular or somewhat depressed, 3 mm broad, 1.5 mm high, broader at the base than at the mouth. The scars left by the fallen fruits on the rachis are relatively large, orbicular, and flat, with the lower bract small but distinct, rounded in its outline, but minutely apiculate in the center, deflexed or ringent. *Fruits* distinctly bifarious, or pectinate, about 6 mm apart and 14 to 18 in number on each side, terete with a blunt apex, very slender, often slightly curved, 13 to 14 mm long, 3 mm thick.

LUZON, Province of Tayabas, *For. Bur. 10155 Curran*, March, 1908; Province of Rizal, *Loher 7055*.

It is one of the smallest and most elegant species known, with unbranched spadices like *P. disticha*, but with pinnately cleft leaves, resembling those of some species of *Geonoma*.

Pinanga sclerophylla Becc. sp. nov.

Mediocris, caudice, ut videtur, circ. 4 cm diam. Folia circiter 85 cm longa; vagina coriacea 35 cm longa; petiolo nullo; segmentis numerosis approximatis, 12–18 mm inter se dissitis, aequidistantibus, subtiliter coriaceis, rigidissimis, omnibus rectis (minime falcatis); basilaribus et intermediis unicostatis, 35–40 cm longis, 16–20 mm latis, longe et sensim acuminatis; superioribus sensim minoribus, apice obtusiusculis, interdum bicostulatis et apice obscure bidentatis, summis in flabellum profunde furcatum unitis. Spadices circiter 25 cm longi, in ramulos nonnullos irregulariter circum axem insertos divisi et parte pedicellari brevi praediti, floribus omnibus distincte 3-seriatis; ramulis fructiferis rigidis, crassiusculis, 14–17 cm longis, basi circiter 4 mm crassis, sursum parum attenuatis, plus minusve trigonis. Fructus triseriati, parvi, late ovati, apice minute apiculato-mammillati, basi (in sicco) abruptissime caudiculati, 13 mm longi, 7.5–8 mm lati, 7–8 mm inter se dissiti; semine late ovato, 8 mm longo, 6.5 mm lato, utrinque rotundato, raphidis ramis ascendentibus ad 9, quorum 3 vel 4 centralibus apicem superantibus, caeteris ad latus recurvis, omnibus laxe anastomosantibus. Perianthium fructiferum depresse cupulare, 4.5 mm latum, circiter 2 cm altum, truncatum, in ore parum coarctatum.

A rather slender plant, about 4 m high. The *stem*, judging by the size of the leaf-sheath, may be about 4 cm in diameter. *Leaves* about 85 cm long in the pinniferous part; petiole quite obsolete; leaf-sheath

coriaceous, about 35 cm long; rachis, in its intermediate portion with a very salient angle in the center of its surface, very finely punctulate under the lens; leaflets numerous, about 35 on each side, equidistant, 12 to 18 mm apart, thinly coriaceous and very stiff, dull and of about the same color on both surfaces, straight, not at all falcate or sigmoidal; those of the base and of the central part are ensiform, unicostate, 35 to 40 cm long, 16 to 20 mm broad, gradually long-acuminate, somewhat narrowed toward the base, which is 7 to 8 mm broad and with the margins bent backward; the upper leaflets shorten gradually and become less acuminate, occasionally they become bicostate, when this occurs, they are obscurely bidentate at the apex; 4 or 5 leaflets of the summit are united together and form a deeply forked flabellum; the mid-costa is very prominent above, beneath it is slender and bears a few linear scales; the secondary and tertiary nerves are rather conspicuous, and give a distinctly striate appearance to both surfaces; the margins are more or less distinctly thickened. *Spadix* about 25 cm long with several branches, irregularly inserted around the axis; the pedicellar part is short and flattened; the branches when bearing fruit are rigid, rather thick, 14 to 17 cm long, 4 mm in diameter at the base, slightly lessening upward, more or less trigonous, the flowers being distinctly arranged in three longitudinal series; the areolæ left by the fallen fruits are very superficial, 7 to 8 mm apart on each longitudinal line, bordered by very narrow bracts; of these the lower has a round margin and is not apiculate in the middle. *Fruits* small, broadly ovoid, inconspicuously apiculate and mammillate at the apex, suddenly caudiculate at the base (when dry) in the portion immersed in the perianth, 13 mm long, 7.5 to 8 mm broad. *Seed* broadly ovoid, 8 mm long, 6.5 mm broad, rounded at both ends, its basal foveola, corresponding to the embryo, slightly oblique; the main vascular branches of the raphe are 9, ascendent, of these 3 or 4 pass over the top, the others bend laterally, and are slightly anastomosed. *Fruiting perianth* shallowly cupular, 4.5 mm broad, 2 mm high, truncate, and slightly narrowed at the mouth.

MINDORO, Mount Halcon, *For. Bur. 4468 Merritt*, June, 1906, altitude about 1,500 m.

Pinanga sclerophylla is evidently closely related to *P. Woodiana*, from which it differs chiefly by its very stiff, unicostate, narrower, and much more approximate leaflets, by the seed which in general is rounder in shape, and in the raphe having more numerous branches.

Pinanga Woodiana Becc. sp. nov.

Mediocris, caudice, ut videtur, circiter 4 cm diametro. Folia circiter 2 m longa; petiolo . . . . ; segmentis numerosis, concinne aequidistantibus, utrinque inter se 15 cm dissitis, spisse chartaceis et rigidis, elongato-lanceolatis, rectis vel vix ad apicem falcatis; intermediis bicostulatis, 55 cm longis et in medio 4.5 cm latis, sursum in acumen longiusculum rigi-

dum abeuntibus, inferne quoque nonnihil attenuato. Spadices circiter 20 cm longi, in ramulos nonnullos irregulariter circum axem insertos divisi, et parte pedicellari brevi praediti; ramulis fructiferis rigidis, crassiusculis, 12–15 cm longis, e basi fere usque ad apicem circiter 4 mm crassis, et, parte apicali excepta, trigonis. Fructus pro maxima parte 3-seriati, superne vulgo bifarii, parvi, ovoideo-elliptici, utrinque aequaliter attenuati, apice minute apiculato-mammillati, 12 mm longi, 7 mm lati; semine ovoideo, 9 mm longo, 6 mm lato, superne rotundato, basi non producto, foveola embrionali nonnihil obliqua, raphidis ramis vulgo 5, vix vel non anastomosantibus, ramo centrali tantum apicem seminis superanti. Perianthum fructiferum depresse cupulare, 3.5 cm latum, 1.5 mm altum, in ore exacte truncatum et parum coarctatum.

A rather slender plant 4 to 5 m high. *Stems* solitary, 3.5 to 4 cm in diameter, with the internodes about 4 cm long and the annular scars or rings left by the fallen leaves 12 to 14 mm broad. *Leaves* about 2 m long; petiole . . . . . ; rachis, in the intermediate portion, with a very prominent salient angle along the center of the upper surface, at first puberulous, later very minutely dotted (under the lens); leaflets about 25, and 5 cm apart on each side, very regularly equidistant; the medial ones bicostulate, elongate-lanceolate, straight, or very obsoletely falcate, stiff and rather thickly papyraceous, 55 cm long, 4.5 cm broad in the middle, and thence gradually narrowing upward to a rather long-acuminate rigid point, they narrow also from the lower third or fourth downward to a base which is about 1 cm broad, are dull and subconcolorous on both surfaces, slightly paler, but not glaucescent, beneath; the costæ in the upper surface are prominent and acute, in the lower rounded and bearing a few elongate scales; secondary nerves very slender, and slightly stouter than the very numerous tertiary ones; this causes the two surfaces, when dry, to be finely striate; the margins are slightly thickened. *Spadices* about 20 cm in length with a pedicellar part 3 cm long, recurved in fruit, divided into not very numerous (14 in one specimen) branches; these are irregularly inserted around the main axis, rigid, about 4 cm thick throughout, 12 to 15 cm long, more or less trigonous. *Flowers* mostly distinctly 3-seriate, the uppermost usually bifarious; the areolæ left by the fallen fruits are very superficial, 5 to 6 mm apart in each line, bordered by very narrow bracts; of these the lower are also very narrow with a round margin and not apiculate in the center. *Fruits* small, 12 mm long, 7 mm broad, red, turning dark-purple, ovoid-elliptic, diminishing equally to both ends, inconspicuously mammilate at the apex. *Seed* ovoid, 9 mm long, 6 mm broad, rounded above, not caudiculate at the base, the embryonal foveola somewhat oblique; the branches of the raphe are usually 5, ascending; of these only that of the center passes over the top of the seed, the others bend at its sides, and not at all or but very slightly anastomose. Albumen very

deeply ruminated. *Fruiting perianth* shallowly cupular, 3.5 mm broad and 1.5 mm high, truncate, and slightly narrowed at the mouth.

MINDORO, Mount Halcon, on forested ridges at 1,100 m altitude, *Merrill 5680*, November, 1906.

At the request of Mr. Merrill this fine palm is named after Major-General Leonard Wood to whom Mr. Merrill was indebted for the opportunity of making the ascent of Mount Halcon.

Related to *Pinanga sclerophylla* and *P. negrosensis*, but more especially to *P. rigida*. It is chiefly characterized by its rigid, not very approximate, lanceolate, bicostulate, straight leaflets, and by the spadices with 3–seriate fruits; the fruits are borne on 3–gonous branchlets, which are inserted all around the main axis.

NORMANBYA F. Muell.

Normanbya Merrillii Becc. sp. nov., Plates XXX, XXXI.

A fine palm with the habit of *Areca Catechu* but with a shorter and thicker stem; this is about 25 cm in diameter at its base, and very closely annulate-cicatricose, sometimes not very straight, slightly tapering toward the summit. *Leaves* large, pinnate, about 2 m long, gracefully and strongly arched, deciduous at every new production of spadices, these being infrafrondales, or springing from below the lowest leaves. *Leaf-sheaths* exactly cylindric, 50 to 55 cm long, and about 15 cm in diameter, coriaceous, thinning and truncate at the mouth, strongly striate on both surfaces, when dry covered externally with a very thin and minute ashy-furfuraceous coating. Petiole short and broad, 10 to 15 cm long, 5 to 6 cm broad, broadly channelled above, convex beneath, its margins acute. Rachis robust, flattened above, narrowly channelled in its basal part and with a slight prominent salient angle higher up, beneath with an obtuse angle below and flattish toward the end. *Leaflets* numerous, about 50 on each side, subequidistant, very closely set at a rather acute angle, and slightly overlapping or subimbricate, narrowly lanceolate, broadest at about the middle, narrowing thence toward the base—where the margins are gradually bent backward—and gradually acuminate to a long, straight, or slightly falcate apex, which in the lower and intermediate leaflets is more or less divided into two linear laciniæ; these in the upper leaflets become shorter and finally disappear in the few leaflets near the top, the apex in these being truncate and denticulate-præmorse; the leaflets are besides firmly papyraceous, with only a central costa; this latter not very stout, almost equally prominent on both surfaces in its basal part, nearly vanishing from the middle upward and furnished with a few, very narrow, 5 to 8 mm long, brown, chaffy scales; the margins of the leaflets are conspicuously thickened by a stout nerve, even thicker than the midcosta; the secondary nerves are faint on the upper surface, which is green, almost shining, and slightly longitudinally plicate along some of the nerves; the lower surface is dull and rendered more or less distinctly ash-colored by a very thin, adherent, undetachable coating; moreover the lower surface is unequally striate by secondary and

tertiary nerves which here are more prominent than above; the largest leaflets, the medials, are as much as 70 to 75 cm in length and 4 to 5 cm in width; those near the base are narrower and shorter than the medials and very acuminate; those of the apex, also narrow, often linear, and quite free at the base. From the bases of the leaflets, and between them, especially in the newly expanded leaves, there often hang long strands which are apparently analogous to the filaments interposed between the divisions of the leaves of the Washingtonias, and of many other palms having palmate leaves. *Spadix* forming a panicle 40 to 50 cm in length and about as wide, with a thick semilunar base embracing the stem, and a very short (2 to 3 cm long) peduncular part; the panicle is ultradecompound, and is divided into several approximate, alternate, very spreading or almost horizontal, rather thick, gradually diminishing primary branches, of which the lowest are twice branched, and the upper ones simply divided into a few branchlets; these ultimate or flowering branchlets are spreading, slightly arched, 3 to 10 cm long, rigid, terete, 1.5 to 2 mm thick at the base, rugose-striate, (when dry) more or less distinctly zigzag-sinuous in the subulate termination; in their lower part, the branchlets bear all around a few (1 to 6) glomeruli of ternate flowers, one female between two males, and higher, almost distically, only solitary male flowers; there is no distinct bract at the base of the branches or branchlets but only a semicircular raised margin. Spathes not seen by me, very early deciduous; their position is marked by 2 or 3 very narrow annular rings around the base of the spadix. The whole inflorescence is smooth and glaucous when fresh and in flower. The 3-nate flowers are subtended by a common and very short scale-like rounded bract; the central female flower is embraced by two special rather conspicuous sepaloid bracts which are crescent-shaped, and which form under the fruiting perianth a slightly concave, 5 mm broad, cup or calycule; the male flowers of the glomerules are devoid of a special bract, while those at the ends of the branchlets, which are single, have a rudimentary one. *Male flowers* symmetric, when full grown and in bud, regularly oblong-ovoid, slightly narrowing toward a rather blunt apex, 10 to 12 mm long, 7 mm broad; the calyx cupular, its sepals smooth outside, imbricate, subrotund-reniform or broader than high, with almost scariose, thin, entire, glabrous margins, otherwise very thinly coriaceous, slightly thickened and gibbous at the base; the corolla twice as long as the calyx; the petals coriaceous, smooth outside, and narrowly elliptic, concave or boat-shaped; stamens numerous, somewhat unequal; filaments filiform, very slender, coalescent by their bases, not inflected at their summit, unequal, anthers narrowly linear, also somewhat unequal, 4 to 6 mm long, usually acute or apiculate at the summit, but occasionally obtuse or even emarginate, inserted on the filament a little above the base of the dorsal side, with very narrow parallel cells, which are united by a relatively broad linear connective and are very shortly divided at their base; rudimentary ovary

conspicuous, with a broadly conical ovoid base, suddenly narrowing into a filiform style, which attains the length of the longest anthers and is not thickened at its top. *Female flowers* opening after the fall of the male ones, globose-conical, acute, about 6 mm long, when the males are full grown; sepals strongly imbricate, concave, suborbicular; petals very broad, imbricate in their basal part, suddenly contracted into a very short, triangular, valvate point. *Ovary* 1-celled, 1-ovulate, ovoid, with a trigonous acute apex, this being formed by 3 trigonous connivent stigmas (while still enclosed in the bud); ovule suspended laterally in the small basilar cell; staminodes 6, very small and short, with rudimentary anthers, and forming by their united bases a small 6-toothed hypogynous cup. *Fruiting perianth* accrescent, cupular, 10 mm high, 15 mm across at the mouth, covering the lower third of the fruit; the petals considerably larger and longer than the sepals, with more or less crenulate margins. *Fruit* (when quite ripe) bright-red, 3 cm long, 18 mm broad, elliptic-ovoid or slightly ovoid, suddenly contracted into a short stout beak, upon which rest the remains of the black, short, trigonous, connivent stigmas; pericarp slightly fleshy, on the whole about 1 mm thick when dry; epicarp very thinly crustaceous, very minutely shagreened when seen under a strong lens; mesocarp with a few layers of rigid, slightly anastomosing, slender, unequal fibres, of which some in the outer layer are flattened and 0.5 to 1 mm broad; endocarp thin, crustaceous or subpergamentaceous, polished inside, usually more or less adherent to the testa of the seed. *Seed* erect, ovoid, terete, rounded at both ends, 16 to 17 mm long, 13 mm broad, free in the cavity of the endocarp, to which however the greater part of its pellicular testa is adherent, its surface dull; hilum narrow, extending from the base to the top of the seed; the branches of the raphe are numerous, very distinct and impressed, chiefly descending from the top, much branched and forming a close network all around the entire seed. Albumen bony, usually with a small cavity in the center, deeply and closely ruminated, embryo exactly basilar.

Commonly cultivated as an ornamental tree in Manila and locally known as "Bunga de Jolo" and "Bunga de China" (The Jolo or Chinese *Areca*). The original home of the species is doubtful, and it may not be a native of the Philippines. Mr. Merrill, who has supplied me with specimens, informs me that old residents of Manila state that it was introduced from Jolo, one of the islands of the Sulu Archipelago; however, it has not been collected in a wild state anywhere in the Philippines. Mr. Merrill surmises that this may be the "Areca palm bearing large clusters of scarlet fruit" mentioned by Burbidge[1] as occurring on the "Hill of Tears," Island of Jolo, above an altitude of 1,500 m.

The nuts of *Normanbya Merrillii* are a good substitute for those of *Areca catechu,* and are somewhat used by the natives for chewing with lime and the leaves of *Piper betle.*

The nearest ally of this palm, amongst those known to me, appears to be

[1] The Gardens of the Sun (1880) 213.

Normanbya (*Ptychosperma*) *Muelleri* from New Guinea, with which it exactly agrees in the structure of the fruit, which is ruminate and terete and not deeply sulcate as in the typical species of *Ptychosperma.* From *Normanbya Muelleri* however it differs in the leaflets, which in that palm are set in groups, while they are equidistant in *N. Merrillii.* Furthermore the termination of the leaflets of *N. Merrillii* is not the same as in *N. Muelleri* and in all species of *Ptychosperma,* which have leaflets praemorse at the tip; those of *N. Merrillii* having a bifid apex. It is however, very evident that this structure is derived from that found in several species of *Ptychosperma,* where the two margins of the leaflets are more or less prolonged into a double acuminate point; in addition the uppermost leaflets in *N. Merrillii* are distinctly praemorse.

The genus *Normanbya* is distinguishable from *Ptychosperma* only by its terete, not longitudinally grooved seed, but though very similar in all other characteristics to this, it is perhaps better to keep it as a separate genus, for if we refuse to attach any value to the characters derived from the form and rumination of the seed, we shall find ourselves obliged to consider the genus *Ptychosperma* as an amalgamation of heterogeneous palms.

ONCOSPERMA Blume.

Oncosperma platyphyllum Becc. sp. nov.

Gracile et subelatum (?). Folia elongata; vagina rubiginose furfuracea et spiculis nigris gracillimis armata; petiolo brevissimo; rhachi subinermi; segmentis numerosis aequidistantibus, 4–5 cm inter se dissitis, ensiformibus, acuminatis; intermediis 60 cm longis, 4–4.5 cm latis; superioribus et basilaribus angustioribus et valde brevioribus. Spadix comparate inter affines brevis, ramulis floriferis 27–28 cm longis, 5–6 mm spissis, apicem versus paullo attenuatis, profunde crebreque scrobiculatis, pulvinulis floralibus orbicularibus, 2 mm latis. Fructus 5-seriati, sphaerici, 14–15 mm diametro, stigmatum residuis lateralibus. Perianthium fructiferum 9–10 mm diametro.

Apparently not a large tree, about of the size of *O. gracilipes. Leaves* elongate, with numerous equidistant leaflets; leaf-sheaths finely rusty-furfuraceous, strongly striated externally and more or less covered with very slender needle-like, unequal, brittle, black, shining spiculæ, which vary in length from a few mm to 2 cm; similar spiculæ are to be found near the margins of the petiole on its under surface and a few are scattered along the under surface of the rachis; the petiole is very short, 2.5 to 3 cm broad, rounded beneath, flat above. The intermediate leaflets are 60 cm long, 4 to 4.5 cm broad, 4 to 5 cm apart, ensiform, straight, acuminate, longitudinally plicate along 2 or 3 secondary nerves on each side of the midcosta; upper and lower leaflets narrower and much shorter. *Spadix* apparently not very large; the few flower-bearing branches seen by me are about 27 cm long, 5 to 6 mm thick, narrowing a little toward the apex, very closely and regularly grooved by 5 longitudinal rows of orbicular, slightly concave scrobiculi, which have below them a conspicuous, triangular, acute, horizontal or slightly deflexed bract; the circular scar left by the fallen fruits is 2 mm in diameter. *Fruit* (when

not quite mature) perfectly spherical, 14 to 15 mm in diameter, with a very finely granulated surface, and with the scar left by the stigma quite lateral. *Fruiting perianth* 9 to 10 mm in diameter; the divisions of the calyx and of the corolla very broadly triangular and almost equal. *Seed* . . . . .

NEGROS, Gimagaan River, *Whitford 1670*, May, 1906.

This species seems at first sight to be very similar to *O. gracilipes*, from which, however, it differs in its broader leaflets, in the more slender branches of the spadix, in the perfectly spherical fruit with quite lateral (not subapical) remains of the stigmas, in the smaller perianth, and, occasionally, in the smaller scars left by the fallen fruits on the branchlets.

Oncosperma horridum (Griff.) Scheff.

MINDANAO, District of Zamboanga, San Ramon, *Copeland 1626*.

The above specimen differs but slightly from the plants growing in the Malay Peninsula, and in the islands of the Malay Archipelago. In the specimen I have seen, the spines covering the spathe are, however, criniform and much more slender than in the type; also the dry fruit has a thinner pericarp and the remains of the stigmas are less prominent. The fruits are 22 mm in diameter.

Oncosperma filamentosum Bl.

PALAWAN, Caranagan River, *For. Bur. 3790 Curran*, February, 1906, in river swamps.

The specimens exactly correspond to those of the plant so common along the estuaries of the Malay Archipelago, the Malay Peninsula, Siam, and Cochinchina.

Oncosperma gracilipes Becc. in Philip. Journ. Sci. 2 (1906) Bot. 228.

LUZON, Provinces of Laguna and Tayabas, between Paete and Piapi, *For. Bur. 10148 Curran*, March, 1908, in hill forests, altitude 100 to 200 m.

Growing in clumps, the trunk 10 m high and 12 cm in diameter, fruit red (Curran). The fruits are immature, 14 mm in diameter, slightly longer than broad. The plant seems to be more robust than that on which the species was established.

HETEROSPATHE Scheff.

Heterospathe philippinensis Becc.

Ptychoraphis philippinensis Becc. in Ann. Jard. Bot. Buit. 2 (1885) 90, et in Webbia 1 (1905) 47.

Cuming distributed this palm under *No. 1476* with flowers only; it has been found again by *A. Loher* at Montalban, Province of Rizal, Luzon (*No. 7091* in Herb. Kew.), March, 1906, and on Mount Matulid at 1,200 m elevation, also in the Province of Rizal, in flower and fruit, March 15, 1906, (*No. 7054* in Herb. Kew.).

It is a slender palm 1 to 2 m high, with a *stem* apparently about 2 cm in diameter, sometimes stoloniferous; the *leaves* are delicate, about 80 cm long in the pinniferous part, with numerous very regularly set leaflets; petiole deeply channelled above; leaflets thinly papyraceous, narrow and elongate, very slightly falcate near the apex, which is very acuminate, and has a very shortly cleft tip; the medials are 25 cm long and 12 mm broad; the upper ones are gradually shorter but are not or only slightly narrower, while the lower ones are narrower but not at all or only slightly shorter. The *spadix* is small, about 45 cm long in one specimen, with a very lax panicle carried on a rather long straight peduncular part; the panicle is composed of a few, very spreading,

straight, and filiform branches, of which the lower are bi- or tri-furcate, and the upper simple. The *spathes* are two; the lowest is 18 cm long, flattened, two-edged, with very sharp or narrowly winged margins and a narrowly lanceolate, acuminate, marcescent limb, the second spathe is tubular, closely sheathing lower down, and marcescent above. *Male flowers* oblong, 3 mm long; the segments of the corolla deeply striated externally. *Fruits* ovoid-subventricose, almost symmetrically very suddenly and conspicuously beaked, 10 mm long, 6 mm broad, finely shagreened by numerous linear sclerosomes. *Seed* globular-ovoid, 6 mm long, 5 mm broad.

Heterospathe negrosensis Becc. sp. nov.

Gracilis, 3–5 m alta, caudice 6–9 cm diametro. Folia in parte pinnifera circiter 1.2 m longa, petiolo longiusculo (circiter 50 cm longo), segmentis aequidistantibus, circiter 3 cm inter se dissitis, ensiformibus, acuminatis, prope apicem nonnihil falcatis, intermediis 35–40 cm longis, 2–2.5 cm latis. Spadix nutans, 70 cm longus (in specimine uno) longe pedunculatus, ramulis floriferis teretibus, filiformibus crebre sinuosis, 13–20 cm longis, vix 2 mm crassis. Fructus anguste ellipsoidei, utrinque subaequaliter attenuati, basi acutiusculi, superne fere symmetrice cuspidati, 10–11 mm longi, 5 mm crassi, extus crebre granuloso-lineolati, perianthio late cyathiformi et bracteolis parvis cupulam parvam incompletam simulantibus suffulti; semine ovoideo, basi rotundato, superne acuto, 7.5 mm longo, 4 mm crasso.

This is a more robust plant than *H. philippinensis*, of which, perhaps, it may be considered as the representative form in the Island of Negros. The leaves are larger and have larger leaflets, and the spadix is considerably more robust, with a peduncular part about 10 mm thick, and about 50 cm in length; the fruit is more elongate and very distinctly cuspidate, or acutely beaked, and, consequently, the seed is also more distinctly ovoid and rather acute.

The specimens which I consider as typical, were collected in the Island of Negros, by *H. N. Whitford* (*No. 1539*) in May, 1906, on Mount Silay, Province of Occidental Negros. In the same Island it has also been collected by *A. D. E. Elmer* at Dumaguete, Cuernos Mountains, Province of Negros Oriental, in March, 1908. *Nos. 9434* and *10147*. In Elmer's specimens the leaflets are smaller and the fruits less acuminate than in those represented by Whitford's material; consequently they are nearer than the latter to the true *H. philippinensis* of Luzon.

I reproduce here Elmer's field note of his *No. 9434:* "Slender erect trees 3 to 5 meters high; in damp mossy woods at 4,000 feet or more; stems 2 to 3 inches thick, obscurely ringed, with soft reddish wood; leaves 1 to 3 m long; the lower one-third without leaflets, the basal portion of the petioles expanded, the sides soon becoming marcescent; inflorescence paniculate, 1 to 3 feet long, upon equally long peduncles; flowers small, sessile, cream-white throughout; fruits green, becoming yellowish, and ultimately vermilion-red; the fruits are sometimes eaten, are not hard but wholly tasteless." N. v. *salaway*.

Heterospathe cagayanensis Becc. sp. nov.

Arbor mediocris, circiter 6 m alta. Folia ampla, segmentis aequidistantibus circiter 5 cm inter se dissitis, ensiformibus, acuminatis, prope apicem leviter falcatis, intermediis 65 cm longis, 3 cm latis. Spadix

patule duplicato-ramosus, ramulis floriferis teretibus, vulgo 15–18 cm longis, rigidis, crassiusculis, 2–2.5 mm spissis. Fructus spherici, stigmatum residuis fere exacte apicalibus apiculato-mucronati, 7 mm diametro, perianthio concaviusculo minime pedicelliformi et bracteolis conspicuis, in cupulam brevem elevatis, suffulti.

A tree about 6 m high. *Leaves* large; leaflets equidistant, about 5 cm apart on each side, ensiform, slightly falcate near the end, very gradually acuminate to a long subulate tip, papyraceous, shortly and slightly narrowed toward a not very acute base, subconcolorous on both surfaces, unicostate, accompanied on each side of the mid-costa by two rather prominent and distinct secondary nerves; the margins conspicuously thickened; at the base of the mid-costa on the upper surface is to be found a small but very distinct glandular tubercle; the few leaflets seen by me are apparently from the central part, these are 65 cm long, 3 cm broad. The *spadix* is diffusely twice branched, the primary branches being divided into 2 to 4 flowering branchlets; these are rigid, terete, usually 15 to 18 cm long, 2 to 2.5 mm thick, bearing the flowers and fruits spirally arranged. *Fruit* spherical, almost centrally mucronate-apiculate by the remains of the stigmas, 7 mm in diameter. *Seed* 5.5 mm in diameter. *Fruiting perianth* very slightly concave. Floral bracts forming a distinct shallow cup for receiving the base of the perianth. The main axis of the spadix and branchlets very minutely scabrid.

LUZON, Province of Cagayan, *For. Bur. 11286 Klemme*, April, 1908, local name *dumayaca*.

Closely related to *Heterospathe elata*, but distinguished by its branches and branchlets being shorter, thicker, and more rigid, more deeply scrobiculate, while the flower bracts form a distinct cup; by the fruit being less distinctly tuberculate on its surface, with the remains of the stigmas almost central; and by the perianth being almost explanate and not subpedicelliform.

ARENGA Labill.

Arenga tremula Becc. comb. nov.

Caryota tremula Blanco Fl. Filip. (1837) 744; Kunth Enum. Pl. 3 (1841) 549.

Caudex crassus et brevis, 2 m altus ad summum, circiter 30 cm diametro. Folia amplissima, usque ad 5 m longa, segmentis numerosis alternis; intermediis 55–70 cm longis, ambitu irregulari, in utroque margine antrorsum lobatis et sinubus 4–6 saepius oppositis plus minusve excavatis, in sinubus 4–7 cm dum caetero 7–12 cm latis, antice dentato-serratis, apice rotundato vel lobulato, versus basin plus minus vel longe cuneatis, ipsa basi acuta, ad insertionem in margine inferiori saepius auriculatis; pinna terminali anguste cuneato-flabelliformi, biloba. Flores masculi subclavato-oblongi, basi parum attenuati, in vertice rotundati, staminibus circiter 150. Fructus globoso-oblongi, utrinque rotundati, in vertice obscure 3-costulati, 3.5 cm longi, 3 cm crassi, seminibus elongato-ellipticis, subtrigonis, utrinque obtusis, 25–26 mm longis, 17 mm latis.

Stem short and thick, 2 m high at most, and about 30 cm in diameter. *Leaves* very large, as much as 5 m in length, very similar to those of *A. Ambong;* the leaflets are numerous, alternately subequidistant, in the intermediate portion of the rachis they are 5 to 7 cm apart, and have a conspicuous axillary callus at their insertion; they are firmly papyraceous, green above, paler underneath and whitish, especially when young; the mid-costa is inconspicuously dotted with very minute, orbicular, brown scales; their general form is very irregularly elongate-lanceolate, but the outline is more or less deeply broken by 4 to 6 superimposed indentations and their corresponding lobes, they are more or less cuneately narrowed below to an acute base, which is often shortly auricled on the lower margin; usually the leaflets are also somewhat narrowed above to an obtuse or broadly rounded, or even bilobed apex; the margins of the lobes are irregularly and sharply dentate-serrate; the terminal leaflet is cuneately flabellate and deeply bilobed, the others (in full grown plants) are 55 to 70 cm long, and 4 to 7 cm wide in correspondence with the indentations, and 7 to 12 cm in their broadest parts. *Spadices* with several simple flowering branches, these at the time they are loaded with fruits are subterete, 12 to 14 mm in diameter, glabrous and with a polished surface in the spaces between the fruits. *Male flowers* in bud, when full grown, are subclavate-oblong, 17 to 18 mm long; the calyx shortly cupular, slightly narrowed at the mouth; the sepals broader than high and with a split-crenulate margin, more or less gibbous at the base; petals oblong and boat-shaped, acute but not apiculate; stamens very numerous (150 or more at times); anthers very narrow, subulate, aristate; the scars left by the fallen flowers bear the punctiform marks of 30 to 40 fibro-vascular bundles. The two special bracts of each female flower, after the fall of the fruit, are arched, crescent-shaped, entire and forming a very shallow cup, but with their margins not or only slightly overlapping each other. *Fruiting perianth* 27 mm broad; the sepals transversely elongate-reniform, similar to the floral bracts, but with split-crenulate margins, 12 to 13 mm broad, 5 mm high; the petals coriaceous, concave, deltoid, 15 mm long and about as broad. *Fruits* globose-oblong, equally rounded at both ends, 3.5 cm long, 3 cm broad, not very distinctly tricostulate on the top, and with a small trigonous cleft in the center of this. *Seeds* elongate-elliptic, 25 to 26 mm long, 17 mm broad, subtrigonous, convex on the back, and with an obtuse salient angle on the axial side, blunt at both ends.

Apparently widely distributed in the Philippines. LUZON, Province of Tayabas, *For. Bur. 10213, 10280 Curran,* local name *caong.* CEBU, *Bur. Sci. 1737 McGregor.* PALAWAN, ridge slope 2 miles northwest of Irauan, altitude 200 m, *For. Bur. 3542 Curran,* January, 1906; Mount Victoria, *Bur. Sci. 735 Foxworthy,* March, 1906, altitude 250 m, local name *Ubud.* BALABAC, *Merrill 5372,* October, 1906. A source of sago, the buds also used for food (Curran). The wild people of Palawan, the Tagbanuas, use the pith from the petioles for plugs on the ends of their arrows, to make them fit tightly into their blowguns (Merrill).

There is little or no doubt that this is *Caryota tremula* of Blanco. That author, however, describes the female flowers of this palm as having 6 sepals, probably because he considered the bracts as sepals.

Arenga tremula is very closely related to *A. Ambong*, from which it differs by the male flowers having a rounded top, and more numerous stamens; but specially in its oblong, not spherical fruit.

ORANIA Zipp.

Orania decipiens Becc. sp. nov.

Robusta, caudice circiter 8 m longo, 24 cm diametro. Frondes 4–5 m longae, segmentis supra nitidis, subtus albicantibus, praecipue prope basin pluricostulatis; majoribus usque ad 1 m longis. Spadices ampli, duplicato-ramosi, longe pedunculati, ramulis floriferis gracilibus, inferioribus 40–45 cm longis, superioribus brevioribus, e basi 3 mm crassa sursum in acumen tenue leviter et regulariter "zig-zag" sinuosum sensim attenuatis. Flores in ramulorum dimidiam inferiorem partem terni, intermedio foemineo, alaribus masculis, caetero geminati et tantum masculi. Fructus globosi, basi nonnihil attenuati, ibique subacuti, 40–42 mm longi, 35–37 mm lati; epicarpio fragili, tenui; mesocarpio 3–4 mm spisso, fibris numerosis crassis, fere osseis, in superficie endocarpi erectis, praedito; endocarpio lignoso, tenui, basi paullo producto et obtuse apiculato; semine globoso, basi paullo explanato, 23 mm lato; embryone supra medium locato; albumine osseo, intus pleno.

Stems 8 m high and 24 cm in diameter. *Leaves* large, 4 to 5 m long (Merritt), apparently very similar to those of *O. philippinensis*. Leaflets almost shining above, dull and whitish beneath, with the mid-costa very robust accompanied on each side by 3 or 4 other minor costæ, and with several secondary nerves between these; the median leaflets the largest, up to 1.5 m long, 6 cm broad. *Spadices* large, twice branched, with a robust, and at its base 7 to 8 cm thick, peduncular part; the ultimate divisions or flowering branchlets are slender and of these the lower are 40 to 45 cm long, the upper shorter, 3 mm thick at the base and from here gradually diminishing to a slender, and slightly but regularly, zig-zag-sinuous tip. The flowers are 3-nate in the lower half of the branchlets, and here the flower in the center is female, those at the sides male; upward only geminate male flowers are to be found. *Fruits* spherical in their upper part, slightly prolonged downward into a blunt and slightly gibbous point at their bases which gives them a subpyriform shape, 40 to 45 mm long and 35 to 37 mm broad; epicarp thin and brittle; mesocarp 3 to 4 mm thick, full of numerous, short, almost bony fibers, which are erect in respect to the surface of the endocarp; this is very thin and woody, on the whole spherical and like the general form of the entire fruit slightly prolonged at the base into a very obtuse point. *Seed* globose, with a slightly flattened base, 23 mm broad; the embryo is placed rather far above the middle; albumen bony, solid throughout. The base

of the fruit being slightly asymmetric, the divisions of the perianth are unequally deflexed; otherwise the fruiting perianth is not accrescent, and the segments of the corolla are deltoid, rather blunt and thickish.

MINDORO, Bongabong River, *For. Bur. 4120 Merritt*, May, 1906. N. v. *banga*. MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9179 Whitford & Hutchinson*, January, 1908. The fruits of the specimens from this last locality are however slightly smaller than those of the typical form from Mindoro; they are 37 mm long and 31 to 32 mm thick, and have a thinner mesocarp with the woody fibers less distinctly normal to the surface of the endocarp. Evidently this is a local form, which may be distinguished by the name **mindanaoensis.**

The fruits of *Orania decipiens* are about the size of those of *O. macrocladus*, and by a superficial observation they might be mistaken for these; they are however slightly larger and are not, like those of *O. macrocladus*, perfectly spherical, but are slightly diminished toward the base; they also differ from those of *O. macrocladus* by the thicker mesocarp, full of the peculiar kind of bony fibers erect on the surface of the mesocarp, and interposed between it and the epicarp, which are characteristic of *O. regalis*, *O. philippinensis* etc.; in *O. macrocladus* this kind of fiber is wanting; moreover the position of the embryo differs in the two species, it being placed below the middle of the seed in *O. macrocladus* and not very far from its summit in *O. decipiens*.

LIVISTONA R. Brown.

Livistona Whitfordii Becc. in Martelli's Webbia 1 (1905) 341.

To this species I refer *For. Bur. 5876 Curran*, collected to the north of Aglao, Province of Zambales, Luzon, January, 1907. The height of the plant is said to be 25 m with the trunk 40 cm in diameter. The fruit (which I have not seen) is 2 cm in diameter. Native name *tekis* (Curran).

I have described [2] the petiole of this species as quite smooth, but in the specimen mentioned above, it is armed in its lowest part with rather robust recurved spines, but in the remaining part only with scattered rudimentary tuberculiform spinules, of which some are nearer its apex.

Livistona mindorensis Becc. sp. nov.

Elata, caudice ad 28 m longo, 20 cm diametro. Frondes regulariter multifidae; petiolo inermi; segmentis in parte centrali alte unitis, externe fere usque ad basin separatis, chartaceis, superne nitidiusculis, subtus paullo pallidioribus, profunde bipartitis, sive in lacinias duas longe acuminatas, attamen non flaccidas, divisis. Spadices elongati in quovis spatha terni, sive jam ab ima basi in 3 spadices partiales, aequales, collaterales, ex apice spathae primariae unicae, valde compressae, erumpentes, divisi. Quisque spadix partialis rigidus, rectus, digiti crassitie, teres, spathis tubulosis apice breviter apertis, arcte vaginatus; inflorescentiis partialibus 20–25 cm longis, jam a basi bipartitis, caetero simpliciter ramosis, ramulis fructiferis majoribus 7–8 cm longis. Fructus parvi, sphaerici, 13–14 mm diametro (non plane maturi).

A slender and tall tree, the trunk rising to 28 m in height and being 20 cm in diameter (Merritt). *Leaves* orbicular, regularly multifid and

[2] Webbia *loc. cit.*

with a large, central, undivided part, the primary sinuses remaining at about 80 cm from the apex of the petiole, while at the sides they are only a few centimeters from it; petiole (in one specimen) with quite smooth margins from the base throughout; segments papyraceous, rather brittle, when dry subshining above, slightly paler beneath; transverse veinlets fine and rather sharp; in the leaves of not quite full-grown plants the segments are very deeply bifid and the divisions are elongate, very acuminate, but not hanging; the central segments of the leaves of the adult plant are at their point of separation 4.5 cm broad, and diminish from this point very gradually toward the end, which is deeply bifid, the divisions being about 15 to 20 cm long, and apparently not, or only slightly, hanging. *Spadices* very elongate, triple, or composed of 3, equal, collateral spadices which are quite free from the base and protrude from the same basal spathe; the *sheath* is coriaceous, brittle, of a reddish-brown color, like all the other parts of the spadix, glabrous and shining, strongly flattened, 9 cm broad, with two almost winged edges; the partial spadices are rigid, straight with several rather distant partial inflorescences, and with the undivided axial parts terete, as thick as a finger, tightly sheathed by tubular spathes, which are quite glabrous, briefly open, expanded at the apex, and terminating with an auriculiform, rather obtuse, or at times shortly bidentate limb. Partial inflorescences divided from near the base into two main branches, these bearing numerous simple floriferous branchlets, of which the lowest are 7 to 8 cm long and the others gradually shorter. The *fruit* is spherical, 13 to 14 mm in diameter, when not quite mature.

In the forests, a few metres above the level of the sea, Bongabong River, MINDORO, *For. Bur. 4108 Merritt*, May, 1906.

It is clearly allied to *Livistona rotundifolia* and *L. microcarpa*, but is distinguished from both by the central segments deeply bifid and with the divisions elongated and gradually acuminate. Moreover I do not know of any other species of *Livistona* with three distinct, equal, collateral spadices issuing from the same basal spathe; but then it is not certain whether or not this is accidental, or is a constant characteristic of *L. mindorensis*. The three flowering axes or partial spadices are very similar in their dimensions, branching, color, and spathes to the corresponding parts of the above-mentioned species. The fruits of *L. mindorensis*, however, are apparently larger than those of *L. microcarpa*, and smaller than those of *L. rotundifolia*.

Livistona inaequisecta Becc. sp. nov.

Robusta; frondium petiolo in parte basilari crebre spinis robustis, plus minusve reversis, 10–15 mm longis armato, superne subinermi; limbo amplo, inaequaliter profunde duplicato-partito, segmentis majoribus 2- vel 3-costulatis, profunde 2- vel 3-partitis, laciniis elongatis, acuminatissimis et apice flaccidis. Spadix elongatus, in 7 vel 8 inflorescentias partiales divisus, spathis primariis subtiliter coriaceis, basi tubulosis, superne antice fissis et apice lanceolato-auriculatis, ad margines fibrosis; inflorescentiis partialibus arcuatis, amplis, duplicato-ramosis, ramulis fructiferis tere-

tibus, 10–20 cm longis et ad basin 2–2.5 mm crassis, crebre tuberculatis. Flores parvi, globosi, 1.6 mm lati. Fructus globosi, perianthio brevissime pedicelliformi suffulti, 14–15 mm diametro, ad maturitatem azureis et nitidis; mesocarpio parcissime crasso; endocarpio tenuissimo, fragili. Semen globosum, non exacte sphaericum, 11 mm latum, intus fere usque ad medium processu raphidis cylindraceo perfossum.

A large and robust tree. *Leaves* large, the blade measuring in one specimen 1.25 m from the ligule to the end of the central leaflets (this came apparently from a full grown plant); leaf-sheaths disintegrated into fibers of a reddish color, and with the principal vascular bundles forming long, woody, very rigid, flattened strands, 2 to 5 mm broad. Petiole armed in its lower portion with numerous and approximate, more or less reversed spines, which have a tumescent base 10 to 12 mm broad, and are 10 to 15 mm long; in the upper portion the petiole bears only a few small superficial spines at the sides near the apex; ligule short, woody, crescent-shaped, with a smooth margin; the blade is firmly papyraceous, green and concolorous on both surfaces, with the divisions marked by very fine and inconspicuous, transverse veinlets; the blade is orbicular in outline, very deeply and unequally multifid, some of the sinuses or reëntering angles between the divisions being either deeper, or else situated nearer the apex of the petiole than others; the deeper sinuses divide the blade into several primary partitions or segments, which are 2- or 3-costulate, and are in their turn subdivided higher up into 2 or 3 secondary segments, the secondary segments are thus separated from each other by the secondary sinuses, and are again deeply cleft into two very acuminate hanging laciniæ; of the primary divisions the outermost remain free a few centimeters above the apex of the petiole, and have very narrow secondary segments and very long and flaccid laciniæ; the intermediate are united for a longer distance, and the single segments are 3 cm broad where they separate from each other, and have shorter ultimate laciniæ than the outermost; the union of the central extends still higher up and the single segments are 4 cm broad at their base, and though also long acuminate are shorter than in all the preceding segments. The *spadix* in one specimen has the peduncular part as thick as the wrist and is divided into 7 or 8 partial inflorescences; these are arched, rather large, twice branched, and have their main axis divided near the base into two branches; the fruiting ultimate branchlets are terete, 10 to 20 cm long, 2 to 2.5 cm thick at the base, with the pulvinuli of the fallen flowers very close together and tuberculiform. The *spathes* are thinly coriaceous, brown, scaly-furfuraceous externally, shining and darker inside, rigid, with a long basal tubular part, which terminates in an elongate auriculiform limb; this is more or less lacerated and fibrous at its margins. *Flowers* small, globular, 1.6 mm in diameter; the sepals orbicular, thick only at their base, otherwise very thin and hyaline; the

corolla is twice as long as the calyx, its divisions deltoid and thickish; the staminal urceolum is 6-lobed, the lobes broader than high, with a very short subulate filament in the center of their retuse upper margins; anthers, after dehiscence, orbicular; carpels glabrous, the style very short. *Fruits* globular, 14 to 15 mm in diameter, when quite mature polished and of a bluish color externally; the mesocarp very scanty; the endocarp woody, very thin, brittle. *Seed* globular, but not a true sphere, 11 mm broad, the intrusion of the raphe cylindraceous, penetrating almost to the center of the albumen. *Fruiting perianth* forming a pediculus to the fruit, very small and short, not quite 2 mm broad.

LUZON, Province of Laguna, Santa Maria Mavitac, *For. Bur. 10079 Curran*, February, 1908, n. v. *ticol;* Cavinti, *Loher 7058*, February, 1906, (Herb. Kew.).

Among the Philippine species of *Livistona* this is easily distinguishable by its leaves being unequally parted into several primary 2- or 3-costulate divisions, having the ultimate divisions very long, very gradually acuminate, and more or less flaccid, and by its round fruit. It is however very closely related to *L. cochinchinensis*, which has also leaves with 2- or 4-costulate primary divisions; but *L. inaequisecta* has smaller flowers and these have the sepals callous and thick only at their base and in the greatest peripheric part are very thin and pellucid, or hyaline. The fruits also are apparently smaller, at least the few that I have seen.

ZALACCA Reinw.

Zalacca Clemensiana Becc. sp. nov.

Folia ampla, petiolo spinis longis armato, segmentis interrupte fasciculatis, elongato-lanceolatis, supra viridibus, nitentibus et albicantibus; intermediis fere rectis et non longe acuminatis, 45 cm longis, 6–6.5 cm latis; superioribus apicem versus leviter falcatis et abrupte in acumen subulatum coarctatis, basi tantum 3-costulatis, caetero unicostatis, costulis lateralibus superne evanescentibus. Spadix masculus ut videtur brevis, in ramos nonnullos approximatos divisus; ramis 6–8 spicas approximatas ferentibus; spathis primariis extus ferrugineo-tomentosis, marcescentibus et dilacerato-fissis; spicis masculis, dum florentibus, cylindraceis, gracilibus, 5–7 cm longis, 10–11 mm crassis, spathellis distinctis, non in annulum connatis, bracteiformibus, late concavis, acutis, striatis; bracteolis parvis, lanoso-ramentaceis. Flores masculi spathellas paullo superantes, 4 mm longi; calyce fere usque ad basin 3-partito, phyllis linearibus subhyalinis; corolla calyce paullo longiori, basi attenuata, fere usque ad medium 3-partita, segmentis oblongis.

Leaves very large, covered with long spines in the petiolar part; rachis in the intermediate portion acutely trigonous, with a line of long spines beneath along the center. Leaflets interruptedly fasciculate, elongate-lanceolate, rigidly papyraceous, shining above, having a very tenuous and adherent ashy-colored coating beneath; the intermediate leaflets almost straight, about 45 cm long, 6 to 6.5 cm broad; those near the summit, and apparently also those near the base, slightly falcate towards the

apex, where they abruptly and symmetrically taper into a long filamentose tip; the margins minutely spinulous from the middle upward, the spinules becoming closer near the apex; transverse veinlets very sharp and prominent on the upper surface, much less visible underneath; the mid-costa almost equally prominent on both surfaces, smooth and accompanied on each side by several unequal, slender, parallel, secondary nerves, of which one, lying nearer to the margin, is often stronger than the others, especially near the base, where the leaflets may be called subtricostulate; but these side costae evanesce upward. *Male spadix* apparently short, with several approximate short branches; each branch being subtended by a primary spathe and bearing 6 to 8 approximate spikelets; the primary spathes are covered with a tenuous, rusty, soft indumentum, are marcescent and much lacerated or split longitudinally, and reduced to several strips and filaments. *Male spikelets* when in flower cylindraceous, slender, 5 to 7 cm long, 10 to 11 mm broad, borne on a very short pedicel, which is embraced by a short and broad, membranaceous, bracteiform secondary spathe; the spathes are not connate by their margins and they do not form an annular involucre, as is usual with the other species, but are individually distinct, bracteiform, concave, very broad, acute, and striate, each bearing two flowers; bracteoles small woolly-ramentaceous. *Male flowers* small, slightly longer than the spathelets, 4 mm long; calyx split to the base into 3, linear, thinly membranaceous or subhyaline, striate segments; the corolla is slightly longer than the calyx, three-parted nearly to the middle, and tapering below, its segments are short, oblong; stamens united to the corolla as far as the base of the segments; anthers oblong, obtuse.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens 1109*, June, 1907.

In its leaflets being whitish beneath, this species approaches *Zalacca Blumeana*, *Z. edulis*, and especially *Z. vermicularis*, but it differs from these as from all the other species known to me, in the spathes and the male spikes, which are individually distinct, and are not connate by their margins to form a compound annular spathe.

KORTHALSIA Bl.

Korthalsia scaphigeroides Becc. sp. nov.

Gracilis, caudice 15–18 mm diametro; ocrea inflata, elongato-elliptica, 9–10 cm longa, 2 cm crassa, subtiliter coriacea, aculeis parvis, brevibus, sparsis, armata. Frondes plantae nondum fertilis non cirriferae, petiolo gracili, complanato, biconvexo, circiter 20 cm longo, 4 mm lato, ad margines inermi; segmentis distincte ansatis, anguste rhomboideo-cuneatis, 15–20 cm longis, 4–6 cm latis, superne in acumen centrale tenue, elongatum, productis et argute dentatis, subtus albicantibus et costulis ad 7 percursis.

Rather slender, the sheathed stem apparently 15 to 18 mm in diameter.

Ocrea elongate-elliptic, ventricose, 9 to 10 cm long, 2 cm broad, thinly coriaceous, armed with small scattered, short, rigid prickles. Leaves with a slender biconvex, flattened petiolar part, about 20 cm long, 4 mm broad, with rather obtuse and smooth edges, armed beneath along the center with a few solitary claws; rachis in the intermediate portion armed almost regularly with ternate claws; leaflets distinctly ansate, narrowly rhomboid-cuneate, broadest above their middle, 15 to 20 cm long, 4 to 5 cm broad, rather acutely praemorse-dentate in the upper margins, and produced at the summit into an acuminate point, green above, white beneath, with about 7 primary costae. Spadix unknown.

MINDANAO, District of Zamboanga, *For. Bur. 4816 Hutchinson*, July, 1906. N. v., *tanguguid*.

This is to all appearances the representative form in the Philippines of *K. scaphigera* from which it differs in the much more elongate ocrea.

To *K. scaphigeroides* are probably to be referred some noncirriferous leaves from young plants collected on BASILAN ISLAND, *For. Bur. 6106 Hutchinson*, July, 1906.

Korthalsia squarrosa Becc. sp. nov.

Mediocris, caudice vaginato, 2 cm diametro. Frondes cirro verticillatim aculeato terminatæ; vagina spiculis gracilibus, 5–6 mm longis, armata; ocrea longiuscula (6–7 cm longa), chartacea, marcescenti et fragili, arcte vaginanti, minime inflata, in ventre aperta; petiolo superne plano, subtus convexo, ad margines spinis nonnullis rectis, horizontalibus, armato; segmentis longiuscule ansatis, rhomboideo-cuneatis, 18–20 cm longis, 6–7 cm latis, supra viridibus, subtus albicantibus, antice argute inaequaliter dentatis, dentibus majoribus aristatis. Spadicis spicae floriferæ cylindraceæ, apice obtusæ, 20 cm longæ, 20–22 mm crassæ, squarrosæ, bracteis in tomento non immersis, late ovatis, argute venoso-striatis; apice non adpresso, triangulari; floribus inter bracteolas in dorso carinatas et paleolis vestitas, nidulantibus, 13 mm longis; calyce cyathiformi, usque ad medium trilobo; corolla calyce 3-plo longiori. Fructus . . . . . .

Sheathed stem about 2 cm in diameter. *Leaf-sheaths* armed with very small slender spiculæ, 5 to 6 mm long, resting on a tuberculiform base. *Ocrea* papery, marcescent, brittle, rather elongate (apparently 6 to 7 cm long), closely sheathing but open on the ventral side (not inflated). *Leaves* of the adult plant terminated by a long and slender cirrus, which is densely armed with semiverticillate, very slender, sharp claws; petiole quite flat above, convex beneath with acute margins, sparingly armed with short, straight, horizontal spines. Leaflets green above, white beneath; those of the upper part of cirriferous leaves having 11 main and radiating nerves or costæ and being 18 to 20 cm long and 6 to 7 cm broad in their upper part, from where they gradually or cuneately narrow downward to a very acute and distinctly ansate base; the upper part of the blade is triangular and acuminate and acutely but irregularly toothed, with the largest teeth aristate. *Spikes* cylindraceous, thick and short, and

with a blunt apex, 20 cm long and 20 to 22 mm in diameter, squarrose or with the larger bracts or spathes not immersed in wool, very broadly ovate and terminated by a free, triangular, not appressed, point; this is very finely, neatly, and striately veined longitudinally. *Flowers* 13 mm long, hermaphrodite, solitary in the axils of the bracts from which the summit of the corolla emerges; the flowers are not immersed in wool, but are placed between and tightly embraced by two, special, elongate, concave bracteoles which are acutely carinate on the back and are covered on the carinae and at the summit with furfuraceous, appressed paleolae (not woolly hairs); calyx cyathiform, parted to the middle into 3, broadly ovate, obtuse, concave lobes, very finely striate-veined; corolla about 3 times as long as the calyx, parted to about the middle into 3 oblong segments. *Fruit* . . . . . .

PALAWAN, near Iwahig, *For. Bur. 4185 Curran*, May, 1906.

Of this very distinct species I have seen fragments of the stem and of one leaf and a few detached spikes with flowers in an advanced stage. It is a species very well characterized by its thick, squarrose, glabrous spikelets, the bracts and the flowers not being immersed in wool. In this respect *Korthalsia squarrosa* closely resembles *K. robusta* Bl., which has the same kind of spikes and flowers. The spikes with squarrose spathes are quite different from the usual form in *Korthalsia*, being very similar to those of some species of *Zalacca*.

To *K. squarrosa* apparently belongs a sterile specimen collected by *Elmer D. Merrill, No. 5384*, on BALABAC ISLAND, although this has much broader leaflets than those of the specimen described above; but this in *Korthalsia* is a very variable characteristic, as the breadth of the leaflets seems to vary on the same plant with its age and with their position along the stem.

In the above-mentioned specimen collected by Merrill, the leaf is about 70 cm long in the pinniferous part; the petiole is 10 cm long; the rachis is irregularly armed with small alternate claws; the leaflets are few, 6 or 7 on each side, rhomboid, distinctly ansate, especially the upper ones, 15 to 20 cm long, 8 to 10 cm broad; the ocrea is truncate at the summit, open on the ventral side, 12 cm long, and armed with very slender, needle-like, horizontal spiculae, 10 to 15 mm long.

Vidal 4066, collected at Sorsogon, Luzon, is also a *Korthalsia*, but the specimen of this number in my herbarium is indeterminable, as it consists only of the intermediate portion of a leaf which resembles that of *Merrill 5384*, but larger and with a shorter petiole; probably Vidal's specimen belongs to a species differing from *K. squarrosa*.

CALAMUS Linn.

Calamus Hookerianus Becc. in Ann. Bot. Gard. Calcutta 11: *tab. 70*.

I have identified with this species a *Calamus, For Bur. 10630 Curran*, collected at about 200 m elevation on the Adumay Hills, Province of Albay, Luzon, June, 1908.

The above-mentioned specimen exactly agrees with *plate 70* of my monograph; the leaflets, however, of the type specimen bear bristles on three nerves on the upper surface, but beneath only on the mid-costa, while in Curran's specimen three nerves on both surfaces are bristly.

The native country of *C. Hookerianus* was not previously known, the type specimen in the Herbarium at Kew being of uncertain origin; now that we

know that *C. Hookerianus* is a Philippine species, it is possible that the original specimen was one of Cuming's distributed plants.

The extremely elongated spadix, the very long, slender, simple partial inflorescences, the long, divaricate, cylindraceous spikelets, the forms of the spathels, involucre, and perianths of the young fruits, are exactly the same in Curran's specimen and in the type of the species at Kew.

Calamus Arugda Becc. sp. nov.

Scandens, mediocris. Folia (cirrifera) nonnihil ampla, segmentis aequidistantibus, in parte media 6–7 cm inter se dissitis, e basi acutiuscula elliptico-lanceolatis, acuminatis, rigide chartaceis, 5-costulatis, inferne nudis, superne vix vel non secus costulas spinulosis, medianis 45–46 cm longis, 5–6.3 cm latis. Spadix foemineus densus, in ramulos breves utrinque spicis 3–4 valde approximatis praeditos; spathis superioribus tubuloso-infundibuliformibus, 3–5 cm longis, in ore marcescentibus; spicis brevibus, 3–4 cm longis, paucifloris; spathellis concavis amplectentibus. Flores foeminei vulgo in spicarum parte basilari gemini, et flore alari vel neutro destituti, superne solitarii et flore neutro comitati. Fructus (immaturi) ovoideo-elliptici, basi attenuati, superne late conice rostrati; squamis per orthostichas 15 ordinatis, squarrosis, apice paullo productis et eroso-ciliolatis.

Scandent, of moderate size or rather large, the stems (naked canes ?) 3 cm in diameter (Klemme). *Leaf-sheaths* . . . . . *Leaves* rather large; in the small portion seen by me they have equidistant, alternate, not very closely set leaflets (6 to 7 cm apart); the intermediate portion of the rachis is slightly convex beneath and is here armed with small claws along the middle, above it is 2-faced with an obtuse, salient angle. Leaflets elliptic-lanceolate, broadest at about their middle, and narrowing equally to both ends, gradually acuminating to a not conspicuously bristly tip, the base acute, rigid-papyraceous, green, slightly paler beneath than above, 5-costulate, the costæ very sharp, smooth, or bearing a few inconspicuous spinules above, quite smooth beneath, margins very minutely and appressedly spinulous from the base, transverse veinlets very fine, very approximate and continuous; the leaflets seen by me, apparently belonging to the intermediate portion of a leaf from a young plant, are 45 to 46 cm long, 5 to 6.3 cm broad. *Male spadix* . . . . . *Female spadix,* not entire, apparently very dense; the summit of one (or of a partial inflorescence ?) with several short, approximate branchlets, each of these terminated by a short, unarmed, thick, caudiculum, 10 to 15 cm long. *Spathes* (primary or secondary ?) tubular-infundibuliform, 3 to 5 cm long, thinly rusty-furfuraceous, thinly coriaceous, exsuccous, marcescent, and more or less fibrous-lacerate at the mouth, prolonged at one side into a triangular, acuminate and acutely, dorsally keeled point; the keel covered with rigid spiculiform bristles which rest on bulbous bases; branchlets inserted inside, but near the mouth of their respective spathes, 6 to 8 cm long, with 3 or 4 spikelets on each side; secondary (or tertiary ?) spathes infundibular, similar to the primary but smaller, and not

bristly; spikelets short, 3 to 4 cm long, rather broad, with a zigzag-sinuous axis, and with only 4 or 5 alternate flowers, or pairs of flowers, on each side; spathes broad, concave, embracing the involucre, and produced at one side into a triangular point; involucrophore concave, quite sessile, attached laterally to the base of the spathel above its own; involucre shallowly, and, often, asymmetrically cupular, usually bidentate at one side. *Female flowers* ovate, 6 mm long, usually in pairs at each spathel in the lower part of the spikelets; in this case they are not accompanied by a neutral flower; near the end of the spikelets the female flowers are solitary, and the involucre bears a very depressed, lunate, sharply defined areola for the reception of the neuter flower. *Fruit,* when still very young, ventricose in the middle, narrowed at both ends, stoutly beaked and terminated by three, small, recurved stigmas. *Scales* in fifteen longitudinal series, not channelled along the middle, of a straw-yellow color in the posticous part and with a broad black marginal line, apices squarrose, slightly produced, and erosely-ciliate. *Seed* . . . . . *Fruiting perianth* campanulate, narrowing to a rather acute base; the calyx split down past the middle into three broadly ovate lobes; the corolla barely longer than the calyx.

Luzon, Province of Cagayan, Lalloc, in dense forests at about 50 m above the sea, *For. Bur. 6649 Klemme,* April, 1907.

A very singular species of the group of *C. palustris,* related to *C. Jenningsianus,* but quite distinct by its larger fruit and especially by its geminate flowers in the lower part of the spikelets. N. v. *arugda.*

Calamus Jenningsianus Becc. sp. nov.

Scandens, mediocris, caudice vaginato circiter 2.5 cm diametro; vagina crebre spiculis parvis, brevibus (4–5 mm longis) armata; ocrea breviter ligulaeformi, glabra. Folia cirro robusto elongato terminata, petiolo 12 cm longo, supra plano et aculeis brevibus erectis consperso; segmentis non numerosis, aequidistantibus, 4–5 cm inter se dissitis, e basi acuta anguste elliptico-lanceolatis, acuminatis, 3–5-costulatis, intermediis 22–25 cm longis, 30–32 mm latis. Spadix foemineus breviusculus, caudiculo brevi terminatus; spathis primariis inferne tubulosis, superne apertis et in dorso acute carinatis, carina aculeata; spathis secundariis infundibuliformibus, laxe vaginantibus, spicis brevibus, 2–3 cm longis, scorpioideis, paucifloris; floribus utrinque 2 vel 3, alternis, spathellis infundibuliformibus. Fructus late ovoideo-elliptici, circiter 25 cm longi, 18 mm lati, squamis per orthostichas 12 ordinatis, crassiusculis, valde convexis et profunde in medio canaliculatis, stramineis, anguste nigro-marginatis; semine globoso, 11 mm diametro, undique extus minute foveolato, albumine profunde ruminato.

Scandent, of moderate size; sheathed stem apparently 2.5 cm in diameter. *Leaf-sheaths* rather densely armed with small, rigid, and short (4 to 5 mm long), horizontal spiculæ, which rest on bulbous bases. Ocrea shortly liguliform, glabrous. *Leaves* terminated by a robust

cirrus, and about 80 cm long in the pinniferous part, the petiole about 10 mm broad and 12 cm long (in one specimen), quite flat above, and here sprinkled with small and straight erect spines, convex, and smooth beneath, its margins acute and sparingly prickly, rachis flattish beneath, where only toward the summit it is armed with semiverticillate claws, the lower surface quite smooth, the upper surface of rachis prickly near the base but otherwise smooth and with a not very acute salient angle; the cirrus is strongly armed with $\frac{3}{4}$-verticilled claws. *Leaflets* not very numerous, equidistant, rather remotely set (4 to 5 cm apart on each side); elliptic-lanceolate, broadest about their middle, and equally narrowing to both ends; gradually acuminate to an inconspicuously bristly tip, the base acute, rigid-papyraceous, green on both surfaces, but paler beneath than above, 3- or 5-costulate; the costæ very sharp above, smooth on both surfaces with the exception of 1 or 2 spinules, which are occasionally to be found at the base of the mid-costa on the upper surface; transverse veinlets minute, much interrupted, not very prominent, margins minutely spinulous near the apex, otherwise smooth. The intermediate leaflets are 22 to 25 cm long, 30 to 32 mm broad, the others somewhat smaller, but of the same form. *Male spadix* . . . . . *Female spadix* apparently not very elongate, terminated by a short, tail-like appendix; primary spathes thinly coriaceous, those of the apical portion of the spadix (the others not seen by me) flattened, tubular in their lower part, enlarged above and open on the ventral side, terminated by a triangular, acuminate, acutely keeled point, the keel spinous; secondary spathes infundibuliform, rather loosely sheathing, unarmed, obliquely truncate and ciliolate at the mouth, produced at one side into a short deltoid point; spikelets short, 2 to 3 cm long, scorpioid, rather thick, with very few (4 or 5 in all) alternate flowers; the spikelets of the lower part of the partial inflorescences probably longer and with a few more flowers. Spathels infundibuliform, obliquely truncate, very shortly produced into a rather broad triangular point at one side, obscurely dorsally keeled; involucrophore obliquely attached to the base of the spathel above its own, shallowly cupular, bidentate on the posticous or axial side; involucre shallowly cupular, with an irregular, undulate margin; areola of the neuter flower depressedly lunate, sharply bordered. *Fruit* broadly ovoid-elliptic, about 25 mm long, 18 mm broad, very suddenly and conspicuously beaked, scales arranged in 12 longitudinal series, relatively thick, strongly convex, deeply channelled along the middle, of a straw-yellow color, with a very narrow blackish marginal line, the point also blackish and very slightly produced. *Seed* globular, but not exactly spherical, about 11 mm in diameter, rather regularly and minutely foveolate all around, without a distinct chalazal fovea; albumen very deeply ruminated.

MINDORO, Mount Halcon, *For. Bur. 4400 Merritt*, June, 1906, altitude about 1,500 m. Named in honor of Lieut. T. H. Jennings who accompanied Mr. Merritt on his trip to Mount Halcon.

A very peculiar species belonging to the group of *C. palustris*, but with a seed having a ruminate albumen and with the leaflets equidistant, lanceolate, and 5-costulate. It is related to *C. Arugda*. Of this species I have seen only a leaf, the summit of a spadix, and a few fruits.

Calamus mindorensis Becc. in Philip. Journ. Sci. 2 (1907) Bot. 235.

This species was originally described from the female plant only. Male specimens have now been collected, also in MINDORO, by M. L. Merritt, in June, 1907, *For. Bur. 6217*. It is a commercial rattan. Native name *tumalin*.

It is a very high-scandent plant. The specimen seen by me has a sheathed stem 5 cm in diameter. The *leaves* are about 2 m long and terminate in a very robust cirrus; the petiole is almost obsolete; the leaflets are as already described (*l. c.*) *Male spadix* forming a large, compound and diffuse panicle, 2 m in length, glabrous in all parts, divided into several triple-branched, partial inflorescences; primary spathes thinly coriaceous, greenish-yellow, tubular, tightly sheathing, smooth; the first spathe is 15 cm long, and about 3 cm broad, flattened, two-edged, the edges very sharp and spinous above, horizontally truncate and fringed with paleaceous scales at the mouth, prolonged at one side into an elongate, triangular, dorsally-keeled and spinous point. The partial inflorescences are flexuous, very long and slender, one, belonging to the lower part of the panicle, is 1.2 m in length, with its axial part 5 to 6 mm thick at the base and with about 12 branches, distically inserted on each side; secondary spathes tubular, tightly sheathing, 3 to 4 cm long, smooth, entire, truncate and also ciliate at the mouth, and prolonged at one side into a triangular acute point; the secondary branches are inserted outside the mouth of their respective spathes, and have a distinct axillary callus, they are slender, flexuous, 2 to 2.5 mm thick, 30 cm long, or thereabouts, and bear numerous distichously arranged spikelets; the tertiary spathes are smooth, elongate-infundibuliform, 10 to 15 mm long, truncate and ciliate at the mouth like the others, prolonged at one side into a triangular point which subtends their respective spikelets. The *spikelets* are spreading, arched, usually 2 cm long, or at times shorter, comb-like, bearing about 20, very approximate, exactly bifarious flowers on each side, and when measured with the flowers are about 6 mm broad; spathels very short, very closely packed, concave and almost boat-shaped, obtuse, and deflexed; involucre formed by two concave bracteoles united by their bases, and immersed in their respective spathels which contribute with the involucre to form a small cup to their respective flowers. *Flowers* in contact one with the other, the full grown buds 2.5 to 3 mm long, cylindraceous, apiculate; the calyx has 3, deltoid, acute, deeply striate teeth; the corolla is twice as long as the calyx.

Calamus trispermus Becc. in Perkins Fragm. Fl. Philip. (1904) 46, et in Ann. Bot. Gard. Calcutta 11: *tab. 180.*

Of this species, which was described from very incomplete material, I have seen recently in the Kew Herbarium, a fine specimen with an entire fruiting spadix,

a portion of the stem, and an entire leaf from a full-grown plant; it was collected by *A. Loher* at Montalban, Province of Rizal, Luzon, in February, 1908, (*No. 7071* in Herb. Kew.).

It is a scandent and robust species. The sheathed stem is 5 to 6 cm in diameter and the naked canes are 2.5 cm thick. The *leaf-sheaths* are rather thick and woody, more or less covered with tobacco-colored, very appressed and almost immersed scales, and are strongly gibbous above, obliquely truncate at the mouth, which is entire, has a sharp margin and is more or less furnished with spines; they are also armed, especially in their upper part and above the gibbosity, with rather robust, scattered, horizontal, short (5 to 10 mm long) spines, which have a broad base and leave on the surface of the sheath a very distinct impression of their form; this is concave on the lower and convex on the upper surface; the ligule is represented by a short rim inside the mouth of the sheath. The *leaf* is about 2.2 m long in the pinniferous part and terminates in a rather long, very robust cirrus; the petiolar part is very short, 2.5 cm broad at its base, flattish and covered with small, erect prickles above, rounded and smooth beneath, its margins more or less prickly; the rachis is flattish and also prickly above in its first portion, but higher up becomes convex, and towards the extremity has an obtuse, salient angle; beneath it is slightly convex, more or less covered with rusty scales, and armed toward the upper extremity of the pinniferous part with at first solitary, then ternate, and finally half-whorled very robust claws; on their cirrus the half or the three-quarter whorls are regularly spaced every 3 to 4 cm. The *leaflets* are about 30 on each side, rather regularly alternate and equidistant, 3 to 6 cm apart, and toward the end even more; they are rigidly papyraceous, green, smooth on the nerves and concolorous on both surfaces, somewhat concavo-convex, lanceolate or elliptic-lanceolate, acuminate, the tip bristly; the medial leaflets are 30 cm long, or thereabout, and 5 to 7 cm broad; those of the extremities are smaller, all are 5-costulate, with a few secondary, rather distinct nerves interposed between the costae; transverse veinlets very crowded and numerous; the margins spinulous near the base, the spinules gradually passing into rigid, spreading hairs near the apex. The *spadix* is rather diffuse, 70 cm in length, slightly nodding, with a rather rigid axis and only 4 or 5 partial spreading inflorescenses. The primary spathes are tightly sheathing, fugaciously rusty-furfuraceous, elongate-infundibuliform, armed with small, short claws in their upper part; the lower spathe is 20 cm long, 18 cm broad at the mouth, flattened, very sharply two-edged, entire and obliquely truncate at the mouth, which is fringed with small, rusty paleolæ, and is produced at one side into a triangular, acutely keeled point; the other primary spathes are entire, 10 cm long, narrowing toward the base, where they are flat, with sharp margins on the inner side, and are prolonged at the apex into a triangular, acutely keeled point. The partial inflorescences are 20 to 35 cm in length, have only 3 or 4

spikelets on each side, and terminate in a small, angular, tail-like appendix. The *spikelets* are 7 to 12 cm long, otherwise as already described (*l. c.*).

The type specimen of *C. trispermus* (*Merrill 1645*, Herb. Manila) differs from that collected by *Loher* only in the more elongate spikelets; while the discrepancies which may be noted in the descriptions of the leaves of the two, are due to the fact that the leaf of Loher's specimen is one from the upper part of a full-grown plant, where the leaves have almost equidistant leaflets; while the leaf of Merrill's specimen was a non-cirriferous one, probably from the lower part of the stem, or that of a young plant, where apparently the leaflets are approximate in pairs.

Calamus microcarpus Becc. in Records Bot. Surv. India **2**: 213 et in Ann. Bot. Gard. Calc. **11**: *tab. 218.*

This species, described by me from *Vidal 3952*, has been again collected by *Loher*, (Herb. Kew.), at Montalban, Province of Rizal, LUZON, in 1905, and again in MINDANAO, Camp Keithley, Lake Lanao, by *Mrs. Mary Strong Clemens*, in October, 1907.

An entire leaf of Loher's specimen measures 1.1 m in the pinniferous part, has a rather long petiole, and terminates in a long, rather slender cirrus, which is armed with half whorls of very acuminate claws. The intermediate leaflets are 25 to 30 cm long, 14 to 15 mm broad, and are very distinctly approximate in several groups; they have the mid-costa very prominent, but the side nerves are not so strong as in Vidal's specimen, are quite smooth on the under surface, and have only a few spinules on a nerve on each side of the mid-costa above; the margins are minutely and appressedly spinulous. (In Vidal's type specimen the leaflets have rigid bristles on 3 nerves above, and the margins are spreadingly spinulous.) The *spadix* is 55 cm in length; the *spathes* are conspicuously inflated, and the upper ones not prickly. The *fruits* are ovoid, 8 mm long (without the perianth) and 6 mm broad, otherwise as already described.

Mrs. Clemens' specimen has a spadix apparently longer and more robust that those collected by Loher and Vidal, and the fruits are also slightly larger. In fact, in Mrs. Clemens' specimens, the fruits, when completely mature, are almost globular, or subobovoid-globular, with a short obtuse and relatively large beak, 7 mm through, and 10 mm in length, not including the small perianth which is distinctly pedicelliform. The seed is globular, slightly depressed and 6 mm broad, otherwise as already described.

Calamus microsphaerion Becc. in Perkins Fragm. Fl. Philip. (1904) 45 et in Ann. Bot. Gard. Calcutta **11**: *tab. 204.*

I consider as belonging to this species a sterile specimen, collected by *W. I. Hutchinson* in the Moro Province, Mindanao, in July, 1906. (*For. Bur. No. 4818*). N. v. *pudlus.*

Calamus Diepenhorstii (Miq.) var. **exulans** Becc. var. nov.

This possesses a great likeness to some Malayan forms in the spinescence of the leaf-sheaths, in the extraordinary length of the spadices and in all other principal characteristics; it differs only in the leaflets, which are without bristles on the

mid-costa above, but beneath have the mid-costa closely bristly and the side nerves naked. In the Malayan forms the leaflets have long bristles on 3 nerves beneath, the mid-costa being smooth, while the mid-costa above is bristly. The female spikelets of this variety are also less distinctly zigzag-sinuous, the involucre of the flower does not form so regular and deep a cup as in the type and the areola of the neuter flower is crescent-shaped and not roundish. Otherwise the similarity of the Philippine variety to the Malayan type is very evident.

The male plant was collected by *F. W. Foxworthy* in March, 1906, on Mount Victoria, PALAWAN, (*Bur. Sci. No. 756*), and the female by *Loher*, in Luzon, at Montalban, Province of Rizal, March, 1906, (*No. 7045* in Herb. Kew.). N. v. *palimanac.*

The male specimen has a *leaf* 1.5 m long; the leaflets are numerous, equidistant, subtricostulate, the mid-costa is rather prominent, above bristly-spinulous near the apex, the side costae with long bristles; underneath the mid-costa is furnished with bristles, and the side nerves are naked. The *male spadix* is, as in the species, extraordinarily long, and not essentially different from that of the Malayan type; but the secondary and tertiary branches and the spikelets are inserted just at the mouth of their respective spathes, and these terminate in a broad, horizontal or deflexed point. The male flowers also are slightly smaller, more approximate, inserted at a wider angle, and therefore have the spathes shorter and less distinctly infundibuliform.

In Loher's (female) specimen the sheathed stem is 3 cm in diameter; the leaf-sheaths are strongly gibbous above, and densely armed with horizontal rows of confluent, triangular, laminate, black spines, which have a lighter-colored sharply defined base. An entire leaf has a petiolar part 15 cm long, its total length being 1.18 m; the petiole has prickly margins; the rachis is armed beneath with a line of single claws along the center, and with a similar line on each side. The leaflets are numerous, equidistant, almost equally green on both surfaces; the medials 30 to 35 cm long, 16 to 18 mm broad, rather distinctly 3-costulate, their mid-costa on the upper surface is smooth, or has a few small spinules near the apex, the side costulae are slender, and also have a few straggling spinules; underneath the mid-costa is rather closely bristled, and the side nerves are usually naked, but on these also a few setiform spinules may sometimes be observed. The spadix is 6 (!) meters long (in one specimen), including the slender, terminal, very minutely and closely clawed cirrus, simply decompound, with a few, very distant, partial inflorescences, exactly as in the type, but with the spathes more thickly set with prickles, the secondary and tertiary spathes are also set with minute prickles in their upper part; the spikelets are 15 to 18 cm long, very slightly zigzag-sinuous; with up to 15 or 16 flowers on each side; the involucre is slightly cupular; and the areola of the neuter flower is crescent-shaped, with sharp margins. The fruit is wanting.

Calamus Merrillii Becc. in Webbia 1 (1905) 67 et in Ann. Bot. Gard. Calcutta 11: *tab. 167.*

To this species is referable a fine fruiting specimen with an entire spadix collected by *Loher* at Montalban, Province of Rizal, LUZON, July, 1905, (*No. 7076* in Herb. Kew.).

Of this specimen the sheathed stem is 6 to 7 cm in diameter. The *fruiting spadix* is robust, nodding, 1.3 m long, including a terminal, tail-like, flattened, subulate appendix, which is formed of several tightly sheathing, smooth, or slightly prickly spathes; it is divided into 8 gradually diminishing, spreading, and arched partial inflorescences, of which the largest (which are also the lowest) are 35 to 40 cm in length. The lowest *spathe* is strongly flattened, 3 to 3.5 cm broad, two-edged (the edges sharp and without spines), 16 to 17 cm long, very tightly sheathing, slightly obliquely truncate at the mouth, and very sparingly armed with a few straight small spines; the other primary spathes are tubular, more or less longitudinally split, obliquely truncate at the mouth, prolonged above at one side into an acuminate, dorsally keeled point, and bearing irregularly distributed, small, broad-based, and subbulbous horizontal prickles. The largest partial inflorescences carry 10 to 13 spikelets on each side and terminate in a small smooth tail-like appendix; the secondary spathes are truncate at the mouth, and prolonged at one side into a broad triangular point; they are either quite smooth or have at most one or two rudimentary or tuberculiform prickles. The *spikelets* are 8 to 9 cm in length, slightly flattened, 8 mm broad between the spathels (not taking into account the flowers). *Fruit* spherical, with a rather thick and blunt beak on the top, about 12 mm in diameter. *Leaves* as already described (in Ann. Bot. Gard. Calcutta *l. c.*); the rachis in the lower and intermediate parts is rather deeply channelled above; leaflets 3 to 3.5 cm apart on each side, with bristles which may reach 3 cm in length.

The type specimens of *C. Merrillii* were *Merrill 1893* from Bosoboso, Province Rizal, LUZON, male plant, and *Loher 1361* (Herb. Kew.), in fruit.

Calamus Merrittianus Becc. in Philip. Journ. Sci. 2 (1907) Bot. 233.

I refer to this species specimens collected at Camp Keithley, Lake Lanao, MINDANAO, by *Mrs. Mary Strong Clemens*, in June, 1907, (*Nos. 1112* and *1124*); they differ, however, from the type plant found by *Merritt* in MINDORO, (*For. Bur. 3912*), in the spathes being less densely set with prickles; therefore presenting a transitional form between *C. Merrittianus* and *C. Merrillii.* Perhaps *C. Merrittianus* is only a geographical variety of *C. Merrillii.*

Calamus grandifolius Becc. sp. nov.

Robustus et scandens, caudice vaginato 4 cm diametro; vagina tenuiter lignosa, densissime spinis nigris tenuissimis, 25–30 mm longis, armata; ocrea breviter ligulaeformi, hispida. Folia ampla, 1.7 m in parte pinnifera longa, cirro robusto valde aculeato terminata; petiolo robusto,

25 cm longo, 20–22 mm lato, superne planiusculo et spinis brevibus erectis armato; segmentis numerosis, aequidistantibus, rigide papyraceis, utrinque nitidis, e basi acuta latiuscule lanceolatis, acuminatis, majoribus 40–42 cm longis, 4–5.5 cm latis. Spadix foemineus circiter 50 cm longus, rigidus, strictus, erectus, in paucas (4 in specimine uno) parvas sensim decrescentes inflorescentias partiales divisus et caudiculo inerme terminatus; spathis primariis tubulosis, in ore barbato-hispidis, inflorescentiis basilaribus 7–8 cm longis, utrinque spicis 3 vel 4 praeditis; spathis secundariis infundibuliformibus, apice setosis, spicis brevibus et crassiusculis, 2–3.5 cm longis, paucifloris; floribus biseriatis, sursum versis, e basi plana et 5 mm lata, late conoideis.

Apparently large and scandent. *Sheathed stem* about 4 cm in diameter. *Leaf-sheaths* strongly gibbous above, woody, very densely armed with very slender and scattered, elastic, very narrowly laminiform and sometimes bristle-like, blackish, shining, unequal spines, of which the largest are 25 to 30 mm long. *Ocrea* shortly liguliform, axillary, fringed with long and rigid bristles. *Leaves* very large (in one specimen the pinniferous part is 1.7 m long) terminated by a very robust, strongly clawed cirrus; petiole about 25 cm long, 20 to 22 mm broad, flat at the base above and convex beneath; upwards flattened and biconvex, covered, especially on the upper surface, with short, ascendent spines, these spines also covering the first portion of the rachis; on the margins the spines are not longer than elsewhere; the rachis is armed beneath (from the base upward) first with solitary, then with 2- or 3-nate, and at the extremity with half-whorled, very robust claws; on the upper surface the rachis is convex-bifacial with a smooth salient angle; leaflets numerous, alternate, equidistant, 5 to 7 cm apart (on each side), rigidly papyraceous, shining on both surfaces, rather broadly lanceolate, narrowing from below the middle to a rather acute base, very gradually acuminate to a bristly tip; the intermediate ones 40 to 42 cm long, 4 to 5.5 cm broad; the mid-costa is slender, but sharp above, and has 4 or 5 or at times more, slender, unequal secondary nerves on each side of it; all nerves smooth on both surfaces; transverse veinlets very close together and very sharp; margins remotely and appressedly spinulous. *Male spadix* . . . . . *Female spadix* rigid, strict, erect, short (50 cm long in one specimen), apparently appressed to the stem, with a very short (3 cm long), 15 mm broad, almost unarmed, much flattened pedicellar part, which gradually passes into the first spathe. The *spadix* bears only four small, gradually decreasing partial inflorescences, which are inserted inside the mouths of their respective spathes and are covered in every part with a brown scaly scurf. The primary spathes are tubular, minutely and appressedly furfuraceous at the mouth with stiff, black, shining bristles; the lowest spathe much flattened, two-keeled, the keels bearing rather long, subbristly spines; the upper spathes somewhat inflated, carinate and spinous on the

back, terminated by a short triangular point; the lowest partial inflorescences are the largest, they are 7 to 8 cm long with only 3 or 4 spikelets on each side; secondary spathes infundibuliform, truncate at the mouth and slightly prolonged at one side, furnished at the summit with a few long stiff bristles; *spikelets* short and rather thick, 2 to 3.5 cm long, with two series of 6 or 7, assurgent, not flatly bifarious flowers; spathels very shortly infundibuliform, embracing the involucre, involucrophores and involucre (which are very much alike) very shallowly cupular and orbicular; areola of the neuter flower depressedly lunate and sharply bordered. *Female flowers* conical, 5 mm long and 5 mm broad; the form of the flower being given by the calyx, which has a very broad, flat, callous base, and a very contracted, shortly 3-toothed mouth; the teeth about as long as the small segments of the corolla; stigma small, triangular, spreading.

LUZON, Province of Laguna, Mount Banajao, *Loher 7088*, February, 1906, (Herb. Kew.). N. v. *saba-ang*.

A very singular species, easily distinguishable by its short, straight, rigid female spadix, with the spathes fringed at the mouth by numerous stiff subspiny bristles and also by its large leaves and lanceolate leaflets. It would seem by its short spadix, with its gradually decreasing subinflated spathes, to belong to the group of *C. siphonospathus*, but it has a quite peculiar habit. The spadix is also very much like that of *C. dimorphacanthus*, but the leaves are quite different, and are very similar to those of *C. ornatus*. The spadix was detached, nevertheless I entertain little doubt but that it belonged to the same plant as the leaves described above.

Calamus dimorphacanthus Becc. in Records Bot. Surv. India 2: 214 et in Ann. Bot. Gard. Calcutta 11: *tab. 219*.

Specimens corresponding to the type were collected by *A. D. E. Elmer* on Mount Santo Tomas (Tonglon), Province of Benguet, LUZON, in May, 1904, *No. 6238*.

In these specimens the spadix bears almost mature fruits not differing from those of the type; but the partial inflorescences are more robust, the largest being 12 cm in length, and with the lowest spikelets forked; the primary spathes are fugaciously rusty-furfuraceous, of these the lower are more or less prickly, the upper smooth. The fruits are 8 to 10 mm long. The leaflets are narrow, and are furnished with rather long bristles on the mid-costa above; their margins are ciliate with rather spreading hairs. *C. dimorphacanthus* appears to be a very polymorphous species, including several distinct varieties or subspecies.

Calamus dimorphacanthus var. **montalbanicus** Becc. var. nov.

The specimen upon which I have established this variety is remarkable for the extraordinary spinescence of the leaf-sheaths and especially of the ocrea, which moreover, is extraordinarily developed. The sheathed *stem* is 3 cm in diameter; the *leaf-sheaths* are densely armed with laminate flexible, schistaceous or almost black, unequal spines, the largest being 20 to 25 mm long; the ligule is 15 cm long (in one specimen), papyraceous

and very rigid, very densely beset by very unequal, horizontal, and often subseriate, or confluent spines, otherwise similar to those occurring on the leaf-sheaths. *Leaves* 1.2 m long in the pinniferous part, and terminated by a robust and strongly clawed cirrus; leaflets linear, very numerous and closely set, equidistant, naked underneath, and furnished above on the mid-costa, and on one nerve on each side of it, with a few, but relatively robust, subspiny bristles; the margins are rather closely and appressedly spinulous; the petiole, which is 15 cm long, and the rachis, are both strongly armed above with unequal spines; the medial leaflets are 19 to 20 cm long, and 8 to 10 mm broad. *Male spadix* about 40 cm in length, narrowing gradually to a tail-like tip, with 7 or 8 tubular, gradually diminishing, shortly imbricate, primary spathes. Male partial inflorescences short and dense.

The type specimen of this variety (a male plant in the Kew Herbarium) was collected by *A. Loher* in May, 1905, on the summit of Mount Batay at 1,380 m elevation, near Montalban, Province of Rizal, Luzon, (*No. 7085* in Herb. Kew.).

The variety differs from the type by its leaf-sheaths being very densely spinous, by its large, very rigid and also densely spinous ligule, and by its very narrow 3-nerved leaflets, the 3 nerves bearing bristles on the upper surface. In the type the ligule is membranaceous, brittle, and much less spinous, and the leaflets are bristly only on the mid-costa above, while the hairs on the margins are more spreading.

Calamus dimorphacanthus var. **zambalensis** Becc. var. nov.

A more robust plant than the type. Sheathed *stem* 4 cm in diameter and perhaps at times more; naked canes 2.5 cm in diameter, with a light-straw-colored very polished surface; *leaf-sheath* very densely spinous as in the other forms; ligule not so long as in the type, densely covered with spiculæ. Petiole robust and short, very densely spinous; the leaflets are very numerous, very closely set, rigid, or papery-subcoriaceous, narrowly lanceolate; the medial ones 20 cm long or thereabouts, and 15 to 20 mm broad, naked beneath, and furnished above on the mid-costa with rigid, subspiny bristles; the side nerves are smooth; the margins are conspicuously ciliate with spreading spinules; the cirrus is, as usual in this species, robust and armed with half-whorls of strong and tumescent claws. *Fruiting spadix* 55 cm long in one specimen; primary spathes rather densely spinulous; partial inflorescences short, having few branches and these with few spikelets, which are rigid and thickish; spathels and involucrophore as in the other forms; involucre distinctly discoid, orbicular, flat or slightly convex. *Fruit* larger than in type, globose-ovoid, 13 mm long, about 10 mm broad, borne on a short but distinctly pedicelliform, cylindraceous, fruiting perianth; scales shining, arranged in 15 longitudinal series, slightly furrowed along the middle, brown with a darker uniform margin all around, the point blunt.

Luzon, Province of Zambales, Mount Tapulao, *For. Bur. 8412 Curran & Merritt*, December, 1907, on exposed peaks in the elfinwood, altitude about 2,000

m, very abundant locally and the only species of the genus in the locality according to the collectors.

Prospectus of the varieties of *Calamus dimorphacanthus:*

1. Ligule membranous, brittle, armed with few spinules, leaflets very narrow, bristly only on the mid-costa above, margins ciliated with spreading, spinuliform hairs. Fruit 8 to 10 mm long . . . . . forma *typica*
2. Ligule very long (as much as 15 cm) rigid, very densely armed with horizontal, more or less seriate spines; leaflets very numerous, narrow, bearing above, on the mid-costa, and on one nerve on each side of it, several subspiny bristles; margins ciliated with rather robust spreading spinules.
   var. *montalbanicus.*
3. Ligule relatively short, bristly-spinulous; leaflets very closely set, very stiff and thickish, narrowly lanceolate, furnished with conspicuous subspiny bristles only on the mid-costa above, margins ciliated with spreading spinules. Fruit larger than in type (13 mm long, 10 mm broad).
   var. *zambalensis.*

Calamus halconensis Becc. sp. nov.

Scandens, mediocris, vaginis densissime spinis laminaribus, inaequalibus, creberrime plus minusve seriatis ac basi confluentibus armata; ligula rigide elongata, densissime spinoso-hispida. Frondium petiolo breviusculo (7–8 cm longo), spinis inaequalibus armato; parte pinnifera circiter 1 m longa; cirro validissimo aculeis reduncis robustis semiverticillatis armato; segmentis numerosis, aequidistantibus, ensiformibus, 20–25 cm longis, 13–15 cm latis, subtus levibus, supra in costa media et secus nervos 2 setosis; marginibus crebre adpresseque ciliato-spinulosis. Spadix fructifer circiter 30 cm longus, spathis levibus; inflorescentiis partialibus parvis et parce ramosis. Fructus ovati vel subobovati, obtusissime mucronati, una cum perianthio fructifero, distincte pedicelliformi, 17 mm longi, 12 mm lati; squamis per orthostichas 12 ordinatis, nitidis, luride stramineis, apice rotundatis, in medio profunde sulcatis; semine ovato, 10.5 mm longo, 7 mm lato, grosse alveolato-sulcato et in dorso longitudinaliter sculpto.

Scandent, of moderate size. *Leaf-sheaths* very densely armed with very unequal, laminate, more or less closely seriate, confluent spines; ligule rigid, 5 to 6 cm long, entirely covered, in one specimen, with very rigid, needle-like spiculae of unequal length. *Leaves* with the petiole armed with the same kind of unequal spines as in *C. dimorphacanthus,* 7 to 8 cm long, the pinniferous part apparently about 1 m in length, terminated by a very robust, strongly clawed cirrus; leaflets numerous, equidistant, ensiform, or very narrowly lanceolate, 20 to 25 cm long, 13 to 15 mm broad, smooth underneath, sprinkled above on the mid-costa and on one nerve on each side of it, with not very rigid bristles; margins rather closely and appressedly spinulous. *Fruiting spadix* about 30 cm long, with smooth spathes, and very few, small, slightly branched, partial inflorescences, of which the lowest are only 5 cm in length and have very few spikelets. *Fruit* ovoid or subobovoid, obtusely beaked, 17 mm

long, including the perianth, 12 mm broad; scales in 12 longitudinal series, polished, of a dirty straw color, with a paler, narrow, scarious margin, deeply furrowed in the middle quite to the point, and almost bigibbous, their apices blunt and with a blackish spot. *Seed* ovoid, 10.5 mm long, 7 mm broad, broadly pitted and irregularly grooved, rather deeply furrowed on the raphal side, and without a chalazal fovea.

MINDORO, Mount Halcon, *For. Bur. 4399 Merritt*, June, 1906, in forests at about 1,500 m altitude.

I have seen of this plant only a very incomplete specimen of the leaf-sheath and leaves, an entire spadix, and a few fruits; and these were detached from the spadix, although to all appearances, they really belonged to it. In the vegetative organs, *Calamus halconensis* does not, apparently, differ from some forms of *C. dimorphacanthus*, but the fruit is of different type, and resembles more that of *C. microcarpus*.

Calamus Vidalianus Becc. in Records Bot. Surv. India **2**: 212 et in Ann. Bot. Gard. Calcutta **11**: *tab. 211.*

This, which was an imperfectly known species described by me from *Vidal 938* (Herb. Kew.), has been rediscovered by *A. Loher* at Montalban, Province of Rizal, LUZON, March, 1906, (*No. 7087* in Kew Herbarium).

In Loher's specimen the sheathed stem is 2 cm in diameter, the leaf-sheaths are greenish or purplish-green, gibbous above, feebly armed with very small, straight, broad-based spines, 2 to 3 mm long; the mouth is truncate and fringed with scales and few spinules. One leaf is 1.6 m long in the pinniferous part, and terminates in a rather long, robust, and strongly clawed cirrus; the petiole is quite obsolete; the leaflets are about 30 on each side, rather approximate and equidistant in the lower part of the rachis, more distant and somewhat irregularly arranged above; the medials are 30 to 32 cm long and 20 to 25 mm broad and are usually furnished, near the base of the mid-costa on the upper surface, with 1 or 2 spinules; these are more robust than some which stand higher up; one nerve on each side of the mid-costa is also more or less spinulous, but occasionally a single nerve on one side only is so; underneath all nerves are naked; the rachis on the upper surface of its lower portion, is armed with unequal, erect spines, which disappear higher up, where the rachis is bifacial, with the salient angle very obtuse; underneath, the rachis is smooth in its basal part but toward the end is armed with claws, which are single at first, then geminate, and are finally set in half-whorls. The spadix is erect, diffuse, 90 cm long, with only 4 or 5 partial inflorescences on each side, and terminates in a short tail-like prickly appendix; the lowest spathe is flattened, two-edged, 12 cm long; all the other primary and secondary spathes are fringed at the mouth with small paleolæ; the lower partial inflorescences are 30 to 35 cm long with 7 or 8 spikelets on each side; the upper are shorter, and have fewer spikelets. The lower spikelets are 5 to 6 cm long, and have 10 to

12 flowers on each side; the upper are shorter and bear fewer flowers. The spikelets in Loher's specimen are therefore somewhat more slender, and bear a few more flowers than those of Vidal's *No. 938,* but are otherwise identical with them.

Calamus Blancoi Kunth Enum. Pl. 3 (1841) 595; Becc. in Webbia 1 (1905) 66, Ann. Bot. Gard. Calcutta, 11: *t. 64.*

A specimen with a female spadix collected near Zamboanga, MINDANAO by *W. I. Hutchinson* (*For. Bur. 4819*), July, 1906, does not differ from other specimens that I have seen from Luzon and from Leyte; it is therefore apparently a constant form, although closely allied to *Calamus mollis* Blanco.

Calamus discolor (Mart.) var. **negrosensis** Becc. var. nov.

A specimen of a *Calamus* collected by *F. Danao* in NEGROS, apparently belongs to a distinct variety of the form which I have recently described in Elmer's "Leaflets" as typical *C. discolor.* The specimen consists only of the upper part of the leaf, and of a few partial inflorescences of a male spadix. There is not however all the requisite evidence to prove that this specimen really represents the male plant of *C. discolor,* although the male spadix of the type, and the female one of this proposed variety are unknown; the leaf, however, of the plant from Negros, with its leaflets white beneath, though endowed with some peculiarities of its own, leaves little doubt as to its specific indentity with or at least of its great affinity to *C. discolor.*

It is a high-climber. *Leaf-rachis* rusty-furfuraceous; leaflets very numerous, equidistant, very narrowly linear-lanceolate, broadest at about their middle, green above and white beneath, exactly as in the type, from which, however, they differ in being smaller, and in having a few bristles on the mid-costa above only, while the under surface is sprinkled all over, except at the base, with scattered, small, spadiceous, subspiny bristles; the largest leaflets, i. e., the medials, are 20 to 22 cm long, and 9 to 10 mm broad. *Male spadix* apparently rather large, with several partial inflorescences; each of these forming rather dense panicles, 20 to 30 cm long, twice branched, covered with a soft detachable whitish scurf on the spathes and spathels; secondary spathes infundibuliform, rather loosely sheathing; branches 10 to 12 cm long, or at times less, bearing a few gradually decreasing branchlets, which carry 4 to 6 distichously arranged spikelets on each side; the spikelets are inserted at the mouth of their respective spathes, are 2 to 3 cm long, flattened, comb-like, with perfectly bifarious, horizontal, contiguous flowers; the axes of the spikelets are slender, not brittle; spathes very short, concave, apiculate at one side, very strongly and firmly striately veined; involucre cupular, obliquely truncate, 2-dentate on the axial side. *Flowers* small, ovoid; the calyx sharply and firmly striately-veined like the spathes, with 3 acute teeth.

NEGROS, Province of Negros Occidental, Cadiz, *For. Bur. 12432 Danao,* March 10, 1908, altitude about 50 m above the sea. N. v. *limoran.*

DAEMONOROPS Bl.

Daemonorops Margaritae (Hance) var. **palawanicus** Becc. var. nov.

It is the first and only species of *Daemonorops* of the group of *Cymbospatha* to be discovered in the Philippine Islands. I have referred it to *D. Margaritæ*, a species indigenous to southern China, from which it differs in the seed, which is more or less globular, and obsoletely 3-gonous, and can not be called reniform, as that of *D. Margaritae* is described as being.

PALAWAN, near Iwahig, *Bur. Sci. 899 Foxworthy*, May, 1906.

Daemonorops ochrolepis Becc. var. **radulosus** var. nov.

This differs from the "forma typica" in the petiole, and the first portion of the rachis, being densely prickly on both surfaces; the upper salient angle of the rachis is also spinulous throughout to the end of the pinniferous part.

LUZON, Province of Tayabas, Mauban, *For. Bur. 10190 Curran*, March, 1908. I also refer here a specimen collected at Camp Keithley, Lake Lanao, MINDANAO, *Mrs. Clemens 898*, January, 1907, the fruits globose-ovoid, 15 mm in diameter (very immature), and also *Loher 7078*, male specimen, from the Province of Rizal, LUZON, April, 1905.

Daemonorops Curranii Becc. in Philip. Journ. Sci. 2 (1907) Bot. 238.

To this species must be referred an unnumbered specimen collected by *Mrs. Mary Strong Clemens* in MINDANAO, Camp Keithley, Lake Lanao, September, 1907; it differs however from the type which was collected by *Curran* in PALAWAN (*For. Bur. 3791*), in the leaflets which have 5 bristly nerves above instead of 3, and in the pedicellar part of the spadix which is entirely covered with stiff bristles, which unite in their basal part to form several callous, subcristate bodies; the fruit and the seed, seem also to be more ovoid in the Mindanao than in the Palawan plant.

Daemonorops Clemensianus Becc. sp. nov.

Scandens, caudicibus vaginatis circiter 2 cm diametro; vaginae undique spinis tenuibus nigrescentibus breviter seriatis obsessis et in ore spinis numerosis laminaribus crebre imbricatis, valde elongatis (8–12 cm longis, 2–4 mm latis) armatae, frondium petiolus circiter 25 cm longus, biconvexus, circum et ad margines spinis rectis armatus; rhachis supra levis; cirrus gracilis; pars pinnifera circiter 1–3 m longa, segmentis numerosis, subaequidistantibus 2.5–3.5 cm inter se remotis, lineari-ensiformibus, supra secus nervos 3 spinulosis, subtus in costa media tantum setis longiusculis praeditis; segmentis intermediis 40–42 cm longis, 13–15 mm latis. Spadix masculus 50–60 cm longus, strictus, parte pedicellari 6–10 cm longa et dense spiculifera suffultus; spathis primariis in apicem deltoideum spiculiferum productis; spatha extima spiculis fasciculatis plus minusve praedita; floribus masculis circiter 4 mm longis, calyce breviter cyathiformi. Spadix foemineus rigidus, parte pedicellari spiculis densis et basi confluentibus ac callosis praeditus, in plurimas approximatas inflorescentias partiales, 10–15 cm longas, divisus; spicis majoribus 5–7 cm longis, utrinque 7- vel 8-floris; involucrophoro obconico, 3–4 mm longo. Fructus majusculi, sphaerici, breviter lateque rostrato mammillati, 22–24

mm diametro, squamis per 18 orthostichas ordinatis, stramineis, anguste nitideque longitudinaliter sulcatis; semine irregulariter globoso, 16–17 mm diametro, minute tuberculoso et alveolato; fovea chalazae superficiali, punctiformi, indistincta.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens 1227*, September, 1907.

Related to *D. ochrolepis* but easily distinguishable from this by its very narrowly ensiform leaflets, and larger fruit, which are about the size of those of *D. calapparius*, and among the largest in the whole genus.

Daemonorops Loherianus Becc. sp. nov.

Scandens, caudicibus vaginatis 2.5 cm diametro; vaginae spiculis nigrescentibus, 5–10 mm longis, irregulariter oblique seriatis, armatae, in ore nudae et inermes; frondium petiolus circiter 25 cm longus, valde biconvexus, marginibus acutis, utrinque spinis ascendentibus obsessus; rachis superne spinulosa; cirrus elongatus gracilis; pars pinnifera circiter 1.3 m longa; segmentis numerosis aequidistantibus approximatis, angustissime lanceolatis, apice acuminato-subulatis; intermediis 20–23 cm longis, 14–18 mm latis, supra secus nervos tres crebre setosis, subtus costa media tantum setis longis sparsa. Spadix masculus inapertus, elongatus, angustus, teres, 45 cm longus, 12 mm diametro, erectus, parte pedicellari brevissima dense spinosa praeditus; spathis primariis 7 vel 8, per gradus sensim decrescentibus; spatha basilari acute bicarinata et secus carinas spiculis parvis radiatim fasciculatis praedita, apice rostro tenui spinuloso terminata, caetero inermi, spathis superioribus etiam rostratis et apice spiculiferis, caeterum levibus. Flores masculi pro rata valde elongati et angustissimi (8–10 mm longi, 1 mm crassi); calyce tubuloso, cylindraceo, breviter 3-dentato; corolla calyce triplo longiori, phyllis striatis, angustissimis, acuminatis. Spadix foemineus et fructus desiderantur.

LUZON, Province of Rizal, Siya bundoc, *Loher 7073*, June, 1905, in Kew Herbarium.

It is apparently related to the species of the group of *D. lamprolepis* of the *Piptospatha* division. It is well characterized by the strongly biconvex petiole, and more especially by the very slender and unusually long male flowers, the tubular calyx, and also by the mouth of the leaf-sheaths being quite smooth and entirely devoid of spines, bristles, or other kind of fringe.

ILLUSTRATIONS.

EXPLANATION OF THE PLATES.

PLATE XXX. Normanbya Merrillii Becc. A tree cultivated in Manila, showing habit. Photograph by Martin.

XXXI. Normanbya Merrillii Becc. Fig. 1, fruit, with the epicarp removed, showing the fibers of the mesocarp; fig. 2, seed as seen from the raphal side; fig. 3, seed, side view; fig. 4, seed, longitudinal section; fig. 5, the same in cross section; fig. 6, male flower in bud; fig. 7, male flower with one petal removed; fig. 8, fruiting perianth as seen from above; fig. 9, the same, side view. All figures twice natural size.

PLATE XXX.—NORMANBYA MERRILLI BECC.

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PLATE XXXI.—NORMANBYA MERRILLI BECC.

A PRELIMINARY REVISION OF PHILIPPINE COMBRETACEÆ.

By E. D. MERRILL.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

This small group has been worked over chiefly with a view to clearing up some points connected with the genus *Terminalia*, some species of which are of importance from a forestry standpoint, as the timber is at least locally utilized to a greater or less extent. Four years ago I published a key to the Philippine species of *Terminalia*,[1] recognizing eleven species, the same number that is recognized in the following consideration, although several of the species admitted in the previous paper have been shown by additional material to be invalid, and have here been reduced. In the interim a single new species has been described, and a second one is proposed below. Some changes in nomenclature have also become necessary, and a few of the specimens previously referred to certain species, due to misinterpretation of these, have now been referred to their proper ones. Additional material is required to thoroughly work out the relationships of the forms in the section *Bialata, Terminalia calamansanai* (Blanco) Rolfe, and related forms, while as yet the flowers of *Terminalia quadrialata* are unknown. *T. magarapali* Vid., a very distinct species, judging from the very short description, has not as yet been rediscovered.

Table showing the distribution of Indo-Malayan, Chinese, Formosan, and Philippine Combretaceæ.

Genera.	Philippines.	Formosa.	China.	Malay Peninsula.	Malay Archipelago.	British India.
Anogeissus						4
Calycopteris				1		1
Combretum	4		2	10	11	18
Lumnitzera	2	1		2	2	2
Quisqualis	1	1	1	2	2	3
Terminalia	11	1	1	8	10	12
Total	18	3	4	23	25	40

[1] *Publications of the Bureau of Government Laboratories* 17 (1904) 31–36.

KEY TO THE GENERA.

Petals none, calyx-limb deciduous; trees..... 1. *Terminalia*
Petals 4 or 5.
Calyx-limb persistent; leaves alternate; trees of the mangrove swamps. 2. *Lumnitzera*
Calyx-limb deciduous; scandent shrubs.
Flowers small, the calyx-tube above the ovary less than 1 cm long. 3. *Combretum*
Flowers rather large, the calyx-tube above the ovary 4 to 6 cm long. 4. *Quisqualis*

1. TERMINALIA Linn.

Fruit ovoid, oblong, or elliptic, sometimes compressed, never winged, but in some species keeled at the edges. § CATAPPA.
Fruit ellipsoid, strongly compressed and keeled, about 5 cm long.... 1. *T. catappa*
Fruit oblong, very slightly compressed and keeled, about 10 cm long. 2. *T. magarapali*
Fruit slightly compressed, hardly keeled, 1.5 cm long or less; leaves glandular-punctate ..... 3. *T. edulis*
Fruit not at all compressed or keeled.
Inflorescence of paniculate spikes..... 4. *T. comintana*
Inflorescence of simple spikes; leaves glandular-punctate and with glands in the axils of the nerves; petioles usually with from 1 to 3 glands.
Spikes rather strongly pubescent; leaves 10 to 18 cm long; fruits ellipsoid or ovoid, not or very obscurely apiculate, about 5 cm long. 5. *T. oöcarpa*
Spikes glabrous; leaves 7 to 12 cm long; fruits oblong-ovoid and strongly apiculate or ovoid and scarcely apiculate, 4 cm long or less.
Petioles and midribs usually somewhat pubescent, the former with 3–1, or no glands near the apex; fruits less than 2.5 cm long. 6. *T. pellucida*
Leaves entirely glabrous, very strongly shining and usually dark-brown when dry, the petioles usually with two glands at about the middle; fruits about 4 cm long, strongly apiculate..... 7. *T. nitens*
Fruit elliptic or narrowly elliptic, its edges produced into two broad, coriaceous wings. § BIALATA.
Inflorescence, young branches, petioles and under surfaces of the leaves softly ferruginous-pubescent; fruit, including the wings, 6 cm wide.... 8. *T. blancoi*
Leaves glabrous beneath..... 9. *T. calamansanai*
Fruit equally or subequally 2–3–4-winged, the wings less than 5 mm wide; leaves ovate-elliptic to orbicular-elliptic; spikes panicled..... 10. *T. polyantha*
Fruit equally 4-winged, the wings submembranaceous, 1 to 1.3 cm wide; leaves oblong-obovate to elliptic-obovate, 15 to 25 cm long..... 11. *T. quadrialata*

1. **Terminalia catappa** Linn. Mant. (1771) 519; Hook. f. Fl. Brit. Ind. **2** (1878) 444; F.-Vill. Nov. App. (1880) 80; Merr. in Govt. Lab. Publ. (Philip.) **17** (1904) 35.

T. latifolia Blanco Fl. Filip. (1837) 376, non Sw.

T. mauritiana Blanco l. c. ed. 2 (1845) 264, ed. 3, **2**: 126, non Lam.

Throughout the Philippines at low altitudes, especially near the sea, and somewhat cultivated as a shade tree. India to Malaya and Polynesia; planted in most tropical countries.

Native names *Talisay* or *Dalisay* in most Philippine dialects; Sp.-Fil. *Almendras*, corresponding to the "Indian almond" of English speaking people in the east.

Terminalia polyantha Presl, which was previously reduced by me to this species from the abridged description given by Miquel, is in no way allied to *T. catappa*. The specimen reported as *T. catappa* from Mangsi Island, by A. Gray in the "Botany of the Wilkes U. S. Exploring Expedition", is *T. littoralis* Seem., and was doubtless wrongly localized on the label, as the species is a Polynesian one. The sterile specimen reported also by Gray "from a small island in the Sooloo Sea" as *T. glabrata* Forst.?, may have been *T. catappa*, but I have seen no specimen.

2. **Terminalia magarapali** Vidal Sinopsis Atlas (1883) XXIV, *t. 48, fig. C;* Merr. in Govt. Lab. Publ. (Philip.) **17** (1904) 35.

T. procera F.-Vill. Nov. App. (1880) 80, non Roxb.

ALABAT ISLAND, *fide Vidal*, specimen no longer extant, locally known as *Magarapali*.

This species should prove to be a very distinct one, characterized especially by its very large fruits, which are about 10 cm long. It has not as yet been collected a second time.

3. **Terminalia edulis** Blanco Fl. Filip. ed. 2 (1845) 265, ed. 3, **2:** 127; Vidal Rev. Pl. Vasc. Filip. (1886) 127; Merr. in Govt. Lab. Publ. (Philip.) **17** (1904) 33.

Terminalia angustifolia Blanco l. c. ed. 1 (1837) 377, non Jacq.

Pentaptera mollis Presl Epim. Bot. (1852) 214.

Terminalia mollis Rolfe in Journ. Bot. **23** (1885) 312; Vid. Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 127.

Terminalia belerica F.-Vill. Nov. App. (1880) 80; Vidal Sinopsis Atlas (1883) *t. 48, fig. B*, non Roxb.

LUZON, Province of Cagayan, *For. Bur. 11275 Klemme, For. Bur. 14761, 14814 Darling, For. Bur. 17132 Curran:* District of Bontoc, *For. Bur. 17030 Curran:* District of Lepanto, *Bur. Sci. 7017 Ramos:* Province of Ilocos Sur, *For. Bur. 7116 Klemme:* Province of Nueva Ecija, *For. Bur. 8430, 8471 Curran:* Province of Nueva Vizcaya, *For. Bur. 14862, 14867 Darling:* Province of Zambales, *For. Bur. 5990, 6330 Curran, Merrill 2968:* Province of Pangasinan, *Cuming 1004* (cotype of *Pentaptera mollis Presl*): Province of Bulacan, *For. Bur. 11187 Aguilar:* Province of Rizal, *For. Bur. 1887, 3411 Ahern's collector, Merrill 1626, 2283, Bur. Sci. 2033 Ramos:* Province of Bataan, *Ahern 306, For. Bur. 1387, 1652 Borden:* Province of Tayabas, *For. Bur. 10 Ware, For. Bur. 6049 Kobbe, Merrill 2588, For. Bur. 10226, 10356, 10386 Curran:* Province of Camarines, *For. Bur. 10484, 10779 Curran, Ahern 1.* MINDORO, *For. Bur. 4481, 7142, 8848, 9882 Merritt.* PALAWAN, *For. Bur. 5187, 7421 Manalo.* MASBATE, *For. Bur. 12818, 12657 Rosenbluth, Merrill 2759.* GUIMARAS, *For. Bur. 296 Gammill.* MINDANAO, *For. Bur. 9412, 9488 Whitford & Hutchinson.*

Native names: *Calupi, Calusit, Alupi* (Cagayan); *Calautit* (Ilocos); *Sacat, Calamansali* (Nueva Ecija); *Calaotit* (Nueva Vizcaya); *Calumpit* (Zambales, Bataan, Rizal, Tayabas, Mindoro); *Bisal* (Bulacan); *Gayumayen* (Zambales); *Calumagon, Cotmoc* (Camarines); *Burauis* (Palawan); *Magtalisay, Calumanog* (Masbate); *Tayataya* (Guimaras).

A widely distributed endemic species, yielding the timber commercially known as *Calumpit*. With the abundant material cited above, I am no longer able to distinguish *Terminalia mollis* (Presl) Rolfe from *T. edulis* Blanco. Young specimens of Blanco's species have exactly the same type of pubescence as has Presl's,

and a number of specimens among those above cited show both softly pubescent leaves and branchlets, and other more mature perfectly glabrous leaves on the same branches. Mature plants are nearly glabrous throughout.

4. **Terminalia comintana** (Blanco) Merr. in Philip. Journ. Sci. 4 (1909) Bot. 300.

Bucida comintana Blanco Fl. Filip. (1837) 856, ed. 2 (1845) 265, ed. 3, 2: 48.
Terminalia chebula F.-Vill. Nov. App. (1880) 80, non Retz.
Terminalia multiflora Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 34.

This species is widely distributed in the Philippines, extending from northern Luzon to Mindanao. For numerous specimens representing the species, see those cited by myself *l. c.* Additional material is represented by the following:

LUZON, Province of Cagayan, *For. Bur. 18480 Alvarez:* Province of Ilocos Sur, *For. Bur. 13028 Paraiso:* Province of Nueva Ecija, *For. Bur. 14319 Saroca.* LEYTE, *For. Bur. 12766 Rosenbluth.*

Native names: *Lasila, Lasilac* (Cagayan, Ilocos); *Banglas* (Nueva Ecija); *Bingas* (Zambales); *Magtalopoi* (Pangasinan); *Naghubo, Palauag, Saplungan* (Rizal); *Dinglas* (Batangas); *Bangias* (Tayabas, Mindoro); *Tiroron* (Camarines); *Malatagum* (Zamboanga); *Batitinan* (Zambales, Zamboanga); *Batitinan-babaye* (Ticao); *Bongas, Bungas* (Leyte).

Terminalia polyantha Presl, reduced to this species by me, with doubt, belongs in a different section of the genus.

Celebes.

5. **Terminalia oöcarpa** Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 32, Philip. Journ. Sci. 1 (1906) Suppl. 103, sphalm. *ovocarpa.*

Terminalia ellipsoidea Merr. l. c. 33.
Terminalia pellucida Merr. l. c. pro parte.

LUZON, Province of Cagayan, *For. Bur. 17176 Curran:* Province of Ilocos Norte, *For. Bur. 13880 Merritt & Darling:* Province of Rizal, *Merrill 1829, For. Bur. 2992 Ahern's collector:* Province of Bataan, *For. Bur. 1216, 2075 Borden, Whitford 347, Williams 687, For. Bur. 67 Barnes* (type), *For. Bur. 2249, 2579 Meyer:* Province of Tayabas, *Merrill 1943, 1951, 1952, 2846, For. Bur. 14 Ware, Whitford 820, For. Bur. 10275 Curran, For. Bur. 11512 Whitford:* Province of Camarines, *For. Bur. 10634 Curran, Ahern 52.* MINDORO, *For. Bur. 3699, 11388 Merritt, Whitford 1470, Merrill 2148* (type of *Terminalia ellipsoidea* Merr.).

Native names: *Dalinsi* (Tayabas, Camarines); *Sacat* (Cagayan, Bataan); *Talisay del monte* (Bataan); *Talisay gubat* (Mindoro); *Calutit* (Ilocos); *Mapatad* (Rizal); *Calumpit* (Tayabas, Mindoro); *Balinsil* (Infanta); *Malagabi* (Mindoro).

This species is closely allied to *Terminalia pellucida* Presl, but is distinguished by its larger leaves, much larger fruits, and pubescent spikes. The abundant material now available has lead me to reduce *Terminalia ellipsoidea*, as the characters on which that species was based, do not appear to be constant.

Endemic.

6. **Terminalia pellucida** Presl Epim. (1852) 214; Vidal Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 127; Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 35.

LUZON, Province of Zambales, *For. Bur. 11049 Zschokke, Merrill 1755, 2105, 2901:* Province of Pangasinan, *Cuming 1039* (cotype), *For. Bur. 8268 Curran & Merritt, For. Bur. 14351 Villamil:* Province of Pampanga, *For. Bur. 5923 Curran.* Two specimens from PALAWAN, *Bur. Sci. 752 Foxworthy, For. Bur. 4157 Curran,* may be referable here.

Native names: *Solo-solo* (Pampanga); *Sobo-sobo* (Zambales); *Saguet* (Zambales, Pangasinan); *Sacut*, *Aritongtong*, *Hakit* (Zambales).

Endemic.

7. **Terminalia nitens** Presl Epim. (1852) 214; Vid. Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 127; Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 33, Philip. Journ. Sci. 1 (1906) Suppl. 103.

Terminalia belerica var. *laurinoides* F.-Vill. Nov. App. (1880) 80, non Clarke.

LUZON, Province of Cagayan, *Cuming 1326* (cotype): Province of Ilocos Norte, *For. Bur. 13958 Merritt & Darling:* Province of Ilocos Sur, *For. Bur. 13023, 13048 Paraiso:* Province of Zambales, *Hallier, For. Bur. 6001, 5911 Curran, For. Bur. 8313 Curran & Merritt, For. Bur. 9608, 9611 Zschokke:* Province of Rizal, *Merrill 2800, For. Bur. 10033 Curran, Bur. Sci. 2034 Ramos:* Province of Batangas, *For. Bur. 7634 Curran & Merritt:* Province of Bataan, *For. Bur. 1205, 1547, 1562, 1619, 1738, 3058 Borden, For. Bur. 2241 Meyer, For. Bur. 64 Barnes, Whitford 393, Bur. Sci. 1565 Foxworthy:* Province of Tayabas, *For. Bur. 15264 Rosenbluth.* MINDORO, *Whitford 1479, For. Bur. 7148 Merritt.* PALAWAN, *For. Bur. 4494 Curran.* MASBATE, *For. Bur. 12594 Rosenbluth, Whitford 1691.* MINDANAO, District of Zamboanga, *For. Bur. 9240, 9241, 9166 Whitford & Hutchinson.*

Native names: *Sacat* (Bataan, Rizal, Tarlac, Mindoro, Batangas); *Dalinsi* (Tayabas); *Daminsil, Malagabi* (Mindoro); *Magtalisay* (Masbate); *Mantalisay* (Zamboanga); *Calautit, Calactit, Anaguep* (Ilocos).

The last three species form a group of closely allied forms, but which are distinguishable, I believe, by the characters indicated in the key. The present species is usually distinguishable by its leaves being dark-brown and very shining when dry, a character in which it differs strongly from the other two.

Endemic.

8. **Terminalia blancoi** sp. nov. § *Bialata*.

Terminalia mollis Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 34, non Presl.

Arbor usque ad 20 m alta, ramulis junioribus, foliis subtus, petiolis, inflorescentiis, fructibusque ferrugineo-pubescentibus; foliis chartaceis vel subcoriaceis, elliptico-ovatis vel elliptico-obovatis, acuminatis, basi acutis, usque ad 18 cm longis, nervis utrinque circiter 10, distinctis, petiolo usque ad 4 cm longo; spicis simplicibus, axillaribus, foliis aequilongis; floribus 5-meris; fructibus 3 cm longis, late 2-alatis, cum alis 6 cm latis.

A tree 20 m high or less. Branches terete, brownish, the growing tips thickened, ferruginous-pubescent, and with numerous petiolar scars, the flowers and spikes crowded at the apices. Leaves chartaceous or subcoriaceous, elliptic-ovate to elliptic-obovate, 9 to 18 cm long, 5 to 10 cm wide, the base acute or acuminate, often slightly inequilateral, the apex acuminate, the upper surface glabrous, or the midrib sometimes pubescent, brown when dry and slightly shining, the lower surface paler, usually rather densely and softly ferruginous-pubescent, the pubescence persisting on specimens bearing mature fruits; nerves about 10 on each side of the midrib, distinct, obscurely anastomosing, the ultimate reticulations fine, brown, distinct; petioles 1.5 to 4 cm long, usually with three or four glands, these sometimes wanting. Spikes axillary, solitary, simple, crowded with the leaves at the apices of the branches, about as long as

the leaves, very densely ferruginous-pubescent. Flowers 5-merous, the calyx densely pubescent inside and out, about 4 mm in diameter, the lobes reflexed in anthesis, ovate. Stamens 10. Fruits ovate, slightly pubescent, 3 cm long, including the two coriaceous rounded wings 6 cm wide.

LUZON, Province of Rizal, *Merrill, Decades Philippine Forest Flora 2* (type), *207 Ahern's collector, For. Bur. 3254 Ahern's collector, Bur. Sci. 1069 Ramos, Merrill 2835:* Province of Benguet, Twin Peaks, *Elmer 6395.*

This species is probably the form mentioned by Blanco in the original description of *Gimbernatia calamansanai*, as differing from the original form, which was collected in Laguna Province by Azaola, in its broader fruits, *G. calamansanai* having fruits (including the wings) "mas de una pulgada de ancho y media de alto," while the other form mentioned has fruits up to two and one-half inches wide. The specimens cited above seem to represent a form that is constantly distinct from typical *Terminalia calamansanai*, recognizable by its much larger leaves, larger fruits, and its pubescence. All the sheets from Rizal Province bear the native (Tagalog) name *Calamansacat.*

9. **Terminalia calamansanai** (Blanco) Rolfe in Journ. Linn. Soc. Bot. **21** (1884) 310; Vidal Rev. Pl. Vasc. Filip. (1886) 127; Merr. Govt. Lab. Publ. (Philip.) **17** (1904) 35.

Gimbernatia calamansanai Blanco Fl. Filip. ed. 2 (1845) 266, ed. 3, **2:** 129.

Terminalia alata F.-Vill. Nov. App. (1880) 80, non Kŭrz.

Terminalia parviflora Merr. in Govt. Lab. Publ. (Philip.) **17** (1904) 36, non Presl.

This species presents several forms, which may eventually prove to be of specific rank when more material is available for study and comparison. The typical form is represented by specimens bearing fruits (including the wings) about 4 cm wide, and 2 cm long, as in the following specimens:

LUZON, Province of Zambales, *Merrill 2981, For. Bur. 5839 Curran:* Province of Bataan, *Ahern 785.* MINDANAO, Province of Surigao, *Ahern 329. For. Bur. 6960 Curran,* specimen in flower, from Zambales, is probably also referable here.

Not being satisfied that the following two forms are specifically distinct, they are here indicated as varieties of *T. calamansanai:*

Var. **platypteris** var. nov.

Differt a typo fructibus majoribus, cum alis circiter 2.5 cm longis, 7 ad 8 cm latis.

LUZON, Province of Zambales, Subic, *For. Bur. 371 Maule,* March, 1904, locally known as *Subo-subo.*

Var. **acuminata** var. nov.

Differt a typo et var. praecedente fructibus longioribus, cum alis 3 ad 3.5 cm longis, 5 ad 5.4 cm latis.

LUZON, Province of Tayabas (Principe), *Merrill 1067,* August–September, 1902. Endemic.

10. **Terminalia polyantha** Presl Epim. (1852) 213; Vidal Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128.

Terminalia parviflora Presl l. c. 214; Vidal l. cc.

LUZON, Province of Zambales, *For. Bur. 6950, 6986, 6989, 6990 Curran:* Province of Batangas, *Cuming 1439* (cotype of *Terminalia parviflora*). MINDORO, *Cuming 1516* (cotype of *Terminalia polyantha*).

This species, although remarkably uniform in vegetative and floral characters, shows some variation in its fruits, which have from two to four wings, one of the Cuming specimens showing 2- and 3-winged fruits on the same plant. From an examination of cotypes of both of Presl's species, before me, I am unable to distinguish them, and hence have included both under the first specific name. In my first consideration of Philippine *Terminalia*[2] both of the species described by Presl were misinterpreted, as neither the original descriptions of the species, nor cotype material was then available in Manila. *T. polyantha* was reduced to *T. catappa*, to which it is not at all closely allied, while the specimen referred to *T. parviflora* does not represent that species. Later[3] *T. polyantha* was referred by me with doubt to *T. comintana*, which it resembles strongly in its inflorescence, and closely in its leaves, but which has entirely different fruits.

Endemic.

11. **Terminalia quadrialata** Merr. in Philip. Journ. Sci. 4 (1909) Bot. 301.

This species is represented by a number of specimens from southern Luzon, Masbate, and Samar, but the flowers are as yet unknown. It is apparently universally known as *Toog* in the regions in which it is found.

Endemic.

EXCLUDED SPECIES.

TERMINALIA ARJUNA Bedd.; F.-Vill. Nov. App. (1880) 80.

An Indian form, not known from the Philippines, and doubtless listed by F.-Villar through a misconception of the species.

2. LUMNITZERA Willd.

Racemes axillary; flowers white; stamens as long as the petals..... 1. *L. racemosa*
Racemes terminal; flowers scarlet; stamens twice as long as the petals. 2. *L. littorea*

1. **Lumnitzera racemosa** Willd. in Ges. Naturf. Fr. Neue Schr. 4 (1803) 187; DC. Prodr. 3 (1828) 22; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 452; Miq. Fl. Ind. Bat. 1[1] (1856) 606; F.-Vill. Nov. App. (1880) 81; King in Journ. As. Soc. Beng. 66[2] (1897) 334; Vid. Sinopsis Atlas (1883) *t. 48, fig. G*, Rev. Pl. Vasc. Filip. (1886) 128.

Petaloma alba Blanco Fl. Filip. (1837) 344, ed. 2 (1845) 240, ed. 3, 2: 82; Naves l. c. ed. 3, *t. 126*.

LUZON, Province of Tayabas, *For. Bur. 10334 Curran*, April, 1908. CEBU, *Bur. Sci. 1718 McGregor*, September, 1906.

Native names *Culasi* (Tag.), ex Blanco; *Labau* (Tag.).

In mangrove forests, apparently not very common in the Philippines. India to Formosa, the Malay Peninsula and Archipelago, Madagascar, tropical Australia, and Polynesia.

2. **Lumnitzera littorea** (Jack) Voigt Hort. Suburb. Calcut. (1845) 39; Kurz Forest Fl. Brit. Burma 1 (1877) 469.

Pyrranthus littoreus Jack Mal. Miscel. 2 (1822) 57.

Laguncularia purpurea Gaudich. Voy. Uranie (1826) 481, *t. 104*.

Lumnitzera purpurea Presl Repert. 1 (1834) 155; Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee (1901) 468; Merr. in Forest. Bureau (Philip.) Bull. 1 (1903) 155.

[2] *Publications of the Bureau of Government Laboratories* 17 (1904) 31–36.

[3] *This Journal* 4 (1909) *Botany* 300.

Lumnitzera coccinea W. & A. Prodr. 1 (1834) 316; Miq. Fl. Ind. Bat. 1[1] (1856) 606; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 452; F.-Vill. Nov. App. (1880) 80; Vid. Rev. Pl. Vasc. Filip. (1886) 128; King. in Journ. As. Soc. Beng. 66[2] (1897) 334.

Petaloma coccinea Blanco Fl. Filip. (1837) 345, ed. 2 (1845) 240, ed. 3, 2: 83.

LUZON, Province of Cagayan, *For. Bur. 7083 Klemme:* Province of Zambales, *Merrill 2082, For. Bur. 5888 Curran, Bur. Sci. 4722 Ramos:* Province of Tayabas, *Merrill 2483, 2065, For. Bur. 10234, 10386, 10250 Curran,* (Principe) *Merrill 1146:* Province of Sorsogon, *For. Bur. 10596 Curran.* MINDORO, *Merrill 2395, For. Bur. 5427, 9807, 9892 Merritt.* CULION, *Merrill 583.* PALAWAN, *Bur. Sci. 266 Bermejos, For. Bur. 3511 Curran, Bur. Sci. 614 Foxworthy.* MASBATE, *For. Bur. 12669 Rosenbluth, For. Bur. 1004 Clark.* NEGROS, *For. Bur. 15013 Diehl, For. Bur. 5603 Everett.* DINAGAT, *Ahern 441.* BASILAN, *For. Bur. 4020 Hutchinson.* MINDANAO, Province of Surigao, *Ahern 501;* District of Davao, *Copeland 1323;* District of Zamboanga, *For. Bur. 9345, 9436 Whitford & Hutchinson.*

Native names: *Carifurog* (Negrito, Cagayan); *Lebato, Pasasic, Libato, Agnaya, Aguia, Calapini, Culasi, Anilay, Colisiman* (Tag.); *Tabao, Duloc-duloc, Buloc-buloc, Saga-sa, Maoro* (Vis.); *Panting-panting* (Moro).

In mangroves and beach forests throughout the Philippines, abundant. India to the Malay Peninsula and Archipelago to New Guinea, tropical Australia, and Polynesia. *Lumnitzera pedicellata* Presl of the Marianne and Marshall Islands is doubtfully distinct.

3. COMBRETUM Linn.

Calyx-tube less than 3 mm long.

All parts glabrous or nearly so..... 1. *C. acuminatum*

Inflorescence and calyx-tubes very densely lepidote..... 2. *C. squamosum*

Calyx-tube elongated, at least 5 mm long.

Flowers in elongated spikes, the calyx-tubes only slightly puberulent. 3. *C. extensum*

Flowers densely arranged at the ends of the panicle-branches, the calyx-tubes rather densely puberulent ..... 4. *C. confusum*

1. **Combretum acuminatum** Roxb. Hort. Beng. (1814) 28, Fl. Ind. 2 (1832) 228; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 455; Vidal Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128; F.-Vill. Nov. App. (1880) 81.

SAMAR, *Cuming 1681.*

The range given for this species by Clarke, *l. c.*, is from the Transgangetic Peninsula from Assam to Singapore, Ceylon, Madras Peninsula?, Malaya to the Philippines, but he may have included more than typical *Combretum acuminatum* Roxb. in his conception of the species. King[4] does not include the species in his "Materials for a Flora of the Malayan Peninsula" as occurring in the area covered by that work, nor does he mention it in his discussions of the accepted species. As I have only a fragment of Cuming's specimen, and no Indian material for comparison, I am constrained to accept Clarke's identification of Cuming's specimen for the present. The Philippine specimen seems, however, to differ from Roxburgh's species, as described, in being quite glabrous.

As to the name of the species, Kurz[5] accepts *Combretum costatum* Roxb., which has page priority over *C. acuminatum* Roxb.

[4] Journ. As. Soc. Beng. 66[2] (1897) 335–341.

[5] Forest Flora of British Burma 1 (1877) 465.

2. **Combretum squamosum** Roxb. Hort. Beng. (1814) 28, Fl. Ind. 2 (1832) 231; Miq. Fl. Ind. Bat. 1[1] (1856) 607; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 456; F.-Vill. Nov. App. (1880) 81; Vid. Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 103; King in Journ. As. Soc. Beng. 66[2] (1897) 339.

Combretum squamosum var. *luzonicum* Presl Epim. (1852) 216.

Combretum distillatorium Blanco Fl. Filip. (1837) 295.

Combretum laxum Blanco l. c. ed. 2 (1845) 206, ed. 3, 2: 22; F.-Vill. Nov. App. (1880) 81, non Roxb.

LUZON, Province of Ilocos Sur, *Cuming 1122:* Province of Zambales, *Hallier s. n.:* Province of Nueva Ecija, *For. Bur. 8504 Curran:* Province of Pangasinan, *Bur. Sci. 4831 Ramos:* Province of Rizal, *Bur. Sci. 5 Foxworthy, Merrill 1840, For. Bur. 1995 Ahern's collector:* Province of Bataan, *Whitford 1032, For. Bur. 2304, 2173 Meyer, Elmer 6715, For. Bur. 2341, 2338 Borden.* CULION, Merrill *604.* PANAY, *Copeland s. n.* BASILAN, *Hallier s. n.*

Northern and eastern Bengal to Nepal, Chittagong, the Malay Peninsula and Archipelago.

3. **Combretum extensum** Roxb. Hort. Beng. (1814) 28, Fl. Ind. 2 (1832) 229; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 458; King in Journ. As. Soc. Beng. 66[2] (1897) 337; Merr. in Philip. Journ. Sci. 4 (1909) Bot. 300.

PALAWAN, Mount Pulgar, *Bur. Sci. 547 Foxworthy.* MINDORO, *For. Bur. 4074 Merritt.*

India to the Andaman Islands, the Malay Peninsula, and Java.

4. **Combretum confusum** Merr. & Rolfe in Philip. Journ. Sci. 3 (1908) Bot. 116.

Combretum sexalatum Merr. l. c. 1 (1906) Suppl. 212, pro parte.

LUZON, Province of Rizal, *For. Bur. 3130 Ahern's collector, Bur. Sci. 4607 Ramos.*

An endemic species, closely allied to and possibly not specifically distinct from *Combretum sundaicum* Miq. of the Malay Peninsula and Sumatra.

EXCLUDED SPECIES.

C. WALLICHII DC.; F.-Vill. Nov. App. (1880) 81.

C. OVALIFOLIUM Roxb.; F.-Vill. *l. c.*

C. MICROPETALUM DC.; Llaños in Mem. Ac. Cienc. Madr. 4 (1859) 502.

C. ROTUNDIFOLIUM DC.; Llanos *l. c.*

None of the above species are represented by extant Philippine botanical material, and all were doubtless credited to the Archipelago through misconceptions of the species by F.-Villar and Llanos.

4. QUISQUALIS Linn.

Quisqualis indica Linn. Sp. Pl. ed. 2 (1762) 556; Presl Rel. Haenk. 2 (1830) 25; Blanco Fl. Filip. (1837) 361, ed. 2 (1845) 254, ed. 3, 2: 109; Hook. f. Fl. Brit. Ind. 2 (1878) 459; F.-Vill. Nov. App. (1880) 81; Vid. Cat. Pl. Prov. Manila (1880) 30, Sinopsis Atlas (1883) *t. 48, f. D,* Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128; Miq. Fl. Ind. Bat. 1[1] (1855) 610; King in Journ. As. Soc. Beng 66[2] (1897) 342; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 103, 3 (1908) Bot. 422.

Q. spinosa Naves in Blanco Fl. Filip. ed. 3, *t. 133.*

Q. malabarica F.-Vill. Nov. App. (1880) 81, non Bedd.

Q. densiflora F.-Vill. l. c. non Wall.?

BABUYANES, Camiguin Island, *Bur. Sci. 3958 Fénix.* LUZON, Province of Cagayan, *For. Bur. 18610 Klemme, Bur. Sci. 7930 Ramos:* Province of Isabela, *Bur. Sci. 3127 Mearns, For. Bur. 18582, 18587 Alvarez, Bur. Sci. 8069 Ramos:* Province of Zambales, *Merrill 1746, Cuming 1197:* Province of Nueva Ecija, *Merrill 276:* Province of Bataan, *For. Bur. 1497 Ahern's collector, Bur. Sci. 952 Mangubat, Whitford 39, 1287:* Manila, *Normal School 169 Nuñez:* Province of Rizal, *For. Bur. 2907 Ahern's collector, Merrill 1676, 2324, Bur. Sci. 3300 Ramos:* Province of Tayabas, *Gregory 89, Whitford 706, For. Bur. 6611 Kobbe, Bur. Sci. 2357 Mearns:* Province of Camarines, *Ahern 179, 290:* Province of Albay, *Bur. Sci. 6418 Robinson.* MINDORO, *Merrill 913, 2216, 2464, McGregor 157.* TICAO, *For. Bur. 1053, 2536 Clark.* CEBU, *Barrow 9.* MINDANAO, Lake Lanao, *Mrs. Clemens 278.*

Native names: *Tal-lolong* (Il.); *Talulong* (Cag.); *Tortoraoc* (Zamb.); *Tangolon, Niogniogan, Tangolo* (Tag.); *Bonor, Tangolan* (Vis).

Widely distributed in the Philippines at low altitudes, and occasionally cultivated for ornamental purposes. India (cultivated), to Burma, southern China and Formosa, the Malay Peninsula and Archipelago to New Guinea; cultivated in other tropical countries.

LICHENES INSULARUM PHILIPPINARUM, I.

By E. A. Wainio.

(*Helsingfors, Finland.*)

I DISCOLICHENES.

A. **CYCLOCARPEAE.**

Trib. 1. PARMELIEAE.

1. **EUMITRIA** Stirt.

Axis chondroideus thalli late tubulosus, stratum myelohyphicum, ex hyphis haud conglutinatis formatum, continens.

1. **E. endorhodina** Wain. sp. nov.

Strato gonidiali roseo et reactionibus thalli dignota. Thallus erectus, long. circ. 80 mm, rigidus, stramineo-glaucescens, teres, apices et basin versus laevigatus, ceterum totus verruculis minutissimis (circ. 0.15–0.1 mm latis), apice stramineis, esorediatis, creberrimis instructis, sat increbre dichotome ramosus, ramis adventitiis spinulaeformibus, circ. 1–5 mm longis et 0.2 mm crassis ornatus. Stratum gonidiale crebre contextum, tenue, roseum, primum subalbidum, KHO intensius rubescens. Axis chondroideus tubulosus, KHO intense lutescens, stratum myelohyphicum laxissime contextum, KHO lutescens, continens.

Luzon, prov. Benguet, Pauai, *Bur. Sci. 4543 p. p. Mearns*, alt. 2100 m s. m. Ad corticem *Pini insularis* Endl. Ster.

2. **E. endochroa** Wain. sp. nov.

Var. **papillata** Wain.

Thallus verruculis esorediatis instructus. Strato gonidiali albido-stramineo a specie praecedente differt. Thallus erectus, long. circ. 90–130 mm, rigidus, glauco-stramineus, teres, apices et basin versus laevigatus, ceterum totus verruculis minutissimis (circ. 0.1 mm latis), apice stramineis, esorediatis, creberrimis instructus, increbre dichotome et partim sympodialiter ramosus, ramis adventitiis spinulaeformibus, circ. 2–12 mm longis, circ. 0.2 mm crassis ornatus, jodo non reagens. Stratum gonidiale

tenue, crebre contextum, albido-stramineum, KHO lutescens, dein aurantiaco-fulvescens. Axis chondroideus tubulosus, KHO parum lutescens, stratum myelohyphicum laxissime contextum, KHO leviter lutescens, continens. **E. trullifera** (Nyl.) Wain. (*Usnea* Nyl. apud Cromb., Lich. Chall. Exp. (1878) 224) strato gonidiali stramineo roseo-maculato ceterisque notis ab hac varietate secundum specimen orig. in herb. Nyl. differt.

Luzon, prov. Laguna, mons Banajao, *For. Bur. 7991 p. p. Curran & Merritt:* prov. Lepanto, mons Data, *Merrill 4990 p. p.*, alt. 2100 m s. m. Ad truncos arborum. Ster.

Var. **farinosa** Wain.

Thallus verruculis demum soralia parvula formantibus, crebris instructus. Stratum gonidiale stramineum aut demum sulphureum, KHO leviter lutescens, dein aurantiaco-fulvescens. Axis chondroideus tubulosus, KHO parum lutescens, stratum myelohyphicum laxissime contextum, KHO leviter lutescens, continens. Apothecia circ. 4–5 mm lata, disco carneo-pallido, tenuiter pruinoso, margine spinuloso, spinulis numerosis, excipulo subtus laevigato. Hypothecium stramineum. Epithecium stramineum, granulosum. Sporae distichae, ellipsoideae, apicibus rotundatis, decolores, simplices, long. 0.008–0.009, crass. 0.005–0.007 mm. Asci jodo caerulescentes.

Luzon, prov. Laguna, mons Banajao, *For. Bur. 7991 p. p. Curran & Merritt.* Ad truncum arboris. Fert.

2. **USNEA** (Dill.) Pers.

1. **U. florida** (L.) Wain.

Var. **subcomosa** Wain. (Addit. Lich. Antill.)

Stratum myelohyphicum crebre contextum, KHO intense lutescens. Axis chondroideus crassitudine mediocris.

Luzon, prov. Lepanto, mons Data, *Merrill 4905*, alt. 2100 m s. m. In arboribus. Fert.

2. **U. perplexans** (Stirt.) Wain.

Stratum myelohyphicum crebre contextum, KHO lutescens, dein rubescens. Axis chondroideus crassitudine mediocris.

Luzon, prov. Benguet, Baguio, cum *For. Bur. 15626 Curran.* Ad *Pinum insularem* Endl. Ster.

3. **U. australis** Fr. (*U. cinchonarum* (Fée) Wain.)

Forma **subinermis** Wain. (Étud. Lich. Brés. 1:7)

Thallus erectus, increbre dichotome ramosus, ramulis adventitiis parcis aut fere nullis, crebre verruculosus. Stratum myelohyphicum laxe contextum, KHO lutescens, dein rubescens. Axis chondroideus tenuis.

Luzon, prov. Benguet, Pauai, *Bur. Sci. 4543 p. p. Mearns*, alt. 2100 m s. m.: Prov. Laguna, mons Banajao, *For. Bur. 7991 p. p. Curran & Merritt.* Ster.

4. **U. pycnoclada** Wain. sp. nov.

Thallus fruticulosus, erectus, long. circ. 18–35 mm, sat mollis, stramineus aut demum partim pallido-stramineus, teres, apicem versus creberrime iteratim dichotome ramosus, ceterum minus crebre iteratim dichotome et sympodialiter ramosus, ramis primariis 1–0.5 mm crassis et maxima parte creberrime cartilagineo-verruculosis, verruculis angustissimis, ramis superioribus laevigatis, apices versus soraliis numerosis aut parcis instructus, ramis adventitiis nullis. Stratum myelohyphicum laxissime contextum, KHO non reagens. Axis chondroideus tenuis, neque KHO, nec jodo reagens.

Luzon, prov. Laguna, mons Banajao, cum *For. Bur. 7999, 8000 Curran & Merritt.*

5. **U. philippina** Wain. sp. nov.

Var. **primaria** Wain.

Stratum myelohyphicum KHO non reagens. Thallus pendulus, demum elongatus (200 mm excedens), parum rigidus, stramineus aut glaucescenti-stramineus, teres, increbre aut sat increbre iteratim dichotome ramosus, axillis vulgo patentissimis, ramis primariis 1.5–0.6 mm crassis, laevigatus, partim cortice increbre aut crebre annulato-diffracto, ramis adventitiis et sorediis destitutus. Stratum myelohyphicum bene evolutum, ex hyphis crebre contextis formatum, KHO non reagens. Axis chondroideus crassitudine mediocris (mesinus), KHO non reagens, jodo demum intense caerulescens.

Luzon, prov. Lepanto, mons Data, *Merrill 4982*, alt. 2100 m s. m. Ad *Pinum insularem* Endl. Ster.

Var. **Mearnsii** Wain.

Stratum myelohyphicum KHO lutescens. Thallus apicibus filiformibus, tenuioribus quam in var. *primaria,* ramis primariis 0.7–0.5 mm crassis. Axis chondroideus jodo distincte (at haud intense) caerulescens. Habitu haec species est similis *U. intercalari* Krempelh., at defectu sorediorum et reactionibus ab ea differens.

Luzon, prov. Benguet, Pauai, *Bur. Sci. 4543 Mearns*, alt. 2100 m s. m. Ad *Pinum insularem* Endl. Ster.

6. **U. trichodea** Ach.

U. ciliata (Müll. Arg.) Wain. *U. trichodea* var. *ciliata* Müll. Arg. Lich. Beitr. (Fl. 1875) n. 43, haud *Neuropogon melaxanthus* var. *ciliatus* Nyl. Lich. Nov. Zel. (1867) 245 (=var. *sphacelata* R. Br.)

Thallus pendulus, demum elongatus, flexilis, stramineo-glaucescens aut albido-glaucescens, teres, sympodialiter et increbre dichotome ramosus, ramis primariis 0.7–0.3 mm crassis, laevigatus aut passim parce verruculis parvis instructus (aut in specimine orig. cortice demum annulato-diffracto), sorediis destitutus, ramis adventitiis circ. 1–18 mm longis,

squarrosis partim abundanter instructus. Stratum myelohyphicum ex hyphis crebre contextis formatum, KHO lutescens, dein mox rubescens, jodo non reagens. Axis chondroideus crassitudine mediocris (mesinus), jodo non reagens. Reactionibus cum specimine orig. congruens.

Luzon, prov. Batangas, *For. Bur. 7812 Curran & Merritt.* In ramis arborum. Ster.

Var. **rubiginosa** (Hepp).

U. longissima b. *rubiginosa* Hepp in Zolling. Syst. Verzeichn. (1854) 7; Mont. et v. d. Bosch Lich. Jav. (1856) 2.

U. trichodea v. *rubiginosa* Müll. Arg. Lich. Beitr. (Fl. 1878) n. 84.

Thallus saepe crassior, facile rubescens. Thallus pendulus, demum elongatus, sat fragilis, stramineo-glaucescens, in humiditate facile rubescens, teres, sympodialiter et increbre dichotome ramosus, ramis primariis 1–0.3 mm crassis, laevigatus et passim parce verruculis parvis instructus et in ramis primariis cortice vulgo areolato aut annulato-diffracto, sorediis destitutus, ramis adventitiis circ. 3–15 mm longis, squarrosis abundanter instructus. Stratum myelohyphicum ex hyphis crebre contextis formatum, KHO lutescens, dein mox rubescens. Axis chondroideus crassitudine mediocris (mesinus), facile rubescens, jodo non reagens. Cum specimine, in Java a Kurz lecto, in herb. Nyl. (n. 36472) etiam reactionibus congruens.

Luzon, prov. Bataan, Lamao, *For. Bur. 7530 Curran.* In arbore. Ster.

7. **U. squarrosa** Wain. sp. nov.

Thallus pendulus, demum elongatus, sat flexilis aut leviter fragilis, stramineus aut glaucescenti-stramineus, teres, sympodialiter et increbre dichotome ramosus, ramis primariis 1–0.4 mm crassis, partim laevigatus, partim plus minusve increbre verruculosus, verruculis parvis et saepe parum prominentibus, circ. 0.001 mm latis, stramineis, in ramis primariis cortice vulgo annulato-diffracto, sorediis destitutus, ramis adventitiis circ. 1–22 mm longis, circ. 0.2–0.15 mm crassis, squarrosis abundanter instructus. Stratum myelohyphicum ex hyphis crebre contextis formatum, sat tenue, KHO lutescens, dein rubescens, jodo non reagens. Axis chondroideus sat crassus (pachynus), solidus aut interdum demum poro tenui medullam laxam continente instructus, jodo caerulescens. Apothecia lateralia aut subterminalia, circ. 3–4 mm lata, disco livido-caesio aut carneo-pallido, vulgo bene pruinoso, margine spinulis numerosis aut paucis aut nullis ornato, excipulo subtus laevigato. Sporae 8-nae, ellipsoideae aut subgloboso-ellipsoideae, simplices, decolores, long. 0.008–0.009, crass. 0.005–0.008 mm. Habitu similis est *U. trichodeae* Ach., cujus thallus jodo non reagens et stratum myelohyphicum KHO haud distincte reagens secundum specimen orig. e Nova Scotia in herb. Ach.

Mindanao, Castra Keithley prope lacum Lanao, *Mary Strong Clemens 1308*: prov. Zamboanga, Port. Banga, *For. Bur. 9396 Whitford & Hutchinson.* In arboribus. Fert.

8. **U. longissima** Ach.

Var. **typica** Wain.

Stratum myelohyphicum thalli KHO non reagens; axis chondroideus pachynus, jodo caerulescens.

LUZON, prov. Lepanto, mons Data, cum *Merrill 4944*, alt. 2100 m s. m.: prov. Benguet, Pauai, *Bur. Sci.* ..... *Mearns*, alt. 2100 m s. m. In arboribus. Ster.

Var. **misamisensis** Wain.

Thallus paullo magis fragilis quam in f. *typica*. Stratum myelohyphicum KHO lutescens. Axis chondroideus jodo caerulescens. Apothecia circ. 2–0.7 mm lata, disco concavo aut plano, carneo-pallido, tenuiter pruinoso, margine ramulis numerosis ornato, excipulo subtus laevigato. Sporae 8-nae, ellipsoideae aut subgloboso-ellipsoideae, long. 0.008–0.009, crass. 0.005–0.006 mm.

MINDANAO, prov. Misamis, mons Malindang, *For. Bur. 4807 Mearns & Hutchinson*. LUZON, prov. Lepanto, mons Data, cum *Merrill 4944*, alt. 2100 m s. m. In arboribus. Fert.

9. **U. furcata** Wain. sp. nov.

Var. **communis** Wain.

Stratum myelohyphicum laxe contextum. Thallus pendulus, demum elongatus, flexilis aut sat mollis, stramineus aut stramineo-pallidus, teres, sat increbre iteratim dichotome et partim parceque sympodialiter ramosus, ramis primariis 1.5–0.5 mm crassis, apicibus filiformi-attenuatis vulgo elongatis, laevigatus, leviter nitidus, sorediis destitutus, ramis adventitiis nullis. Stratum myelohyphicum ex hyphis laxe contextis formatum, KHO lutescens, dein rubescens, jodo non reagens. Axis chondroideus tenuis (leptinus) jodo non reagens. Apothecia lateralia aut subterminalia, 5.5–1.5 mm lata, disco carneo-pallido aut testaceo-livido, tenuiter stramineo-pruinoso, margine spinulis numerosissimis aut paucis instructo, excipulo subtus laevigato. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae aut subgloboso-ellipsoideae, long. 0.008–0.011, crass. 0.006–0.008 mm. Hymenium jodo intense caerulescens. Ramificatione thalli et habitu similis est *U. dichotomae* Fr., quae secundum specimen n. 36452 in herb. Nyl. (ex herb. Deless.) thallo parce soredioso et KHO non reagente ab ea differt. *U. fragilis* Wain. et *U. flexilis* Stirt. thallo sympodialiter ramoso ab ea distinguuntur.

LUZON, prov. Lepanto, mons Data, *Merrill 4990*, alt. 2100 m s. m.: prov. Benguet, Pauai, *Bur. Sci. 4543 p. p. Mearns:* prov. Tayabas, mons Banajao, *For. Bur. 7999 Curran & Merritt:* prov. Zambales, mons Tapulao, *For. Bur. 8167 Curran & Merritt*. NEGROS, mons Canlaon, *Banks s. n.* In arboribus. Fert.

Var. **marivelensis** Wain.

Stratum myelohyphicum partim laxe, partim crebre contextum, KHO lutescens, dein mox rubescens, jodo non reagens. Axis chondroideus tenuis, jodo non reagens. Thallus ramis primariis 2–0.2 mm crassis. *U. Vriesiana* Mont. et v. d. Bosch jam reactione thalli ab hac planta differt.

LUZON, prov. Bataan, mons Mariveles, *Merrill 3685*. In arbore. Fert.

3. **OROPOGON** Th. Fr.

1. **O. loxensis** (Fée) Th. Fr.

Forma **fuscescens** Wain.

Habitu et colore thalli *Alectoriae divergenti* (Ach.) similis. Thallus fuscescens, nitidus, poris parcis, subclausis rimaeformibusque, stratis corticalibus neque KHO, nec $CaCl_2O_2$ reagentibus, medulla laxissima et cavernosa KHO distincte lutescente. Thallus etiam in f. *isabellina* Wain. eodem modo reagens (h. e. in forma typica, thallo isabellino-pallescente instructa).

Luzon, prov. Lepanto, mons Data, cum *Merrill 4944*, alt. 2100 m s. m. In arboribus. Ster.

4. **RAMALINA** Ach.

1. **R. pollinaria** (Westr.) Ach.

Var. **insularis** Wain.

Subsimilis var. *intermediae* (Nyl.) et *R. scopariae* Wain., at thallo striis medullaribus parcis parvisque instructo. Thallus long. circ. 20–25 mm, crebre dichotome fastigiato-ramosus, ramis primariis 1–0.5 mm latis, apicibus sensim aut inaequaliter attenuatis, tenuibus, vulgo obtusis, soraliis parvis apicem versus instructus, erectus, compressus, leviter longitrossum corrugatus aut abrupte subcanaliculatus, pallido-stramineus, leviter nitidus, cortice tenui et partim fere semipellucidus. Stratum medullare KHO non reagens. Parum differt a specimine orig. *R. intermediae* (Del.) Nyl.

Ubian, (Archipel. Sulu). *Merrill 5405*. In arbusto. Ster.

2. **R. gracilenta** Ach.

Var. **torulosa** Nyl. (*R. gracilenta* f. *torulosa* Nyl. Rec. Mon. Ramal. (1870) 20).

Secundum specimen orig. n. 37196 in herb. Nyl. thallus striis medullaribus stramineis, brevibus, saepe prominentibus crebre ornatus. Sporae fusiformi-oblongae, apicibus sat obtusis, long. 0.011–0.015, crass. 0.004–0.005 mm, observante Nyl.

Ad corticem arboris prope Manilam lecta a *Gaudichaud*. Fert.

3. **R. linearis** (Sw.) Müll. Arg.

In arboribus in monte, alt. 900 m s. m., in prov. Benguet, insula Luzon, lecta a *Wallis* (secundum specimen in herb. meo). Ster.

4. **R. subfraxinea** Nyl.

Thallus laciniis elongatis, canaliculatis, striis medullaribus oblongis et ellipsoideis, leviter aut parum prominentibus praesertim inferne ornatus, canaliculatus, medulla KHO non reagente. Laciniae elongatae, long. usque ad 10 cm, statura sicut in var. *subcanaliculata* Nyl., at sporae rectae aut parce obliquae, apicibus obtusis, long. 0.10–0.013, crass. 0.004–0.005 mm.

In arboribus in insulis Philippinis secundum specimen a *Llanos* lectum in herb. meo. Fert.

5. **R. vittata** Nyl. l. c. 62.

Secundum specimen n. 36971 in herb. Nyl. in insulis Philippinensibus a *Cuming* lecta. Fert.

5. CETRARIA (Ach.) Th. Fr.

1. **C. straminea** Wain. sp. nov.

Thallus stramineus aut glaucescenti-stramineus et passim nigricanti-variegatus, leviter nitidus, laevigatus aut passim parcissime stigmatoideo-punctatus, intus albus, irregulariter laciniatus lobatusque, laciniis circ. 25–5 mm latis, apice rotundatis, adpressus, apicibus saepe leviter adscendentibus, isidiis et sorediis destitutus, margine passim parce ciliato et pycnoconidangiis sessilibus aut apicibus spinulorum affixis ornato, subtus nigricans, sat nitidus, pseudocyphellis albis, minutis, parum impressis, crebre punctatus, ceterum laevigatus, rhizinis parcissimis instructus, KHO superne non reagens, intus leviter lutescens, dein leviter rubescens, $CaCl_2O_2$ non reagens, his solutionibus unitis superne leviter lutescens, intus leviter rubescens. Statura thalli subsimilis *Parmeliae perlatae*. Herbario Nylanderi haec species deest.

Luzon, prov. Laguna, mons Banajao, *For. Bur. 7988 Curran & Merritt*. Ad truncum arboris. Ster.

6. PARMELIA (Ach.) De Not.

1. **P.** (sect. **Amphigymnia**) **perlata** Kraempelh.

Thallus margine sorediosus, medulla KHO lutescente et, addito $CaCl_2O_2$, rubescente.

Mindanao, Castra Keithley prope lacum Lanao, *Clemens 1300:* prov. Zamboanga, *Copeland "C"*. In rupe. Ster.

2. **P. Zollingeri** Hepp in Zolling. Syst. Verz. (1854) 6; Mont. & v. d. Bosch Lich. Jav. (1856) 16, (haud Hue Lich. Extra-Eur. 207).

P. saccatiloba Nyl. Fl. (1885) 608 (haud Tayl. in Hook. Journ. Bot. (1847) 174, secund. Müll. Arg. Lich. Beitr. n. 1353, et Hue l. c. 206).

Thallus sorediis et ciliis et isidiis destitutus, KHO superne et intus lutescens, $CaCl_2O_2$ non reagens, at his solutionibus unitis intus leviter rubescens. Coll. Zollinger n. 1241 secundum 4 specim. in herb. Nyl. cum speciminibus Philippinensibus congruens; medulla thalli in n. 35330 et 35546 KHO lutescens, in n. 35329 et 35331 primum lutescens, dein dilute fuscescenti-fulvescens.

Luzon, prov. Benguet, *For. Bur. 15627 Curran:* prov. Bataan, mons Mariveles, *Copeland "M"*. Mindanao, Castra Keithley prope lacum Lanao, *Clemens 1314, 1328*. Camiguin (Babuyanes), *Bur. Sci. 4174 Fénix*. Ad truncos arborum. Fert.

3. **P. nilgherrensis** Nyl.

Thallus margine ciliatus et sorediosus. Medulla neque KHO, nec $CaCl_2O_2$ reagens, at his reagentiis unitis rubescens.

Luzon, prov. Lepanto, mons Data, *Merrill 4944*, alt. 2100 m s. m.: prov. Benguet, Baguio, *For. Bur. 15624 Curran*. Ad truncos *Pini insularis* Endl. Ster.

4. **P. corniculans** Nyl. Fl. (1885) 607.

Medulla thalli neque KHO, nec $CaCl_2O_2$ reagens, at his solutionibus unitis intense rubescens. Thallus isidiis et sorediis destitutus, margine bene ciliato. Apothecia perforata, margine plus minusve dentato ciliatoque, excipulo subtus laevigato aut rugoso.

Luzon, prov. Zambales, *For. Bur. 8161 Curran & Merritt:* prov. Benguet, mons Tonglon, *Bur. Sci. 5489 Ramos.* Mindoro, mons Halcon, *Merrill 5738.* Ad truncos arborum et in rupibus. Fert.

5. **P. Merrillii** Wain. sp. nov.

Thallus superne sordide albidus aut glaucescenti-albidus, praesertim centrum versus et ad margines etiam nigricanti-variegatus, intus albus, subtus totus ater aut raro partim ad ambitum pallidus, laciniis circ. 30–10 mm latis, irregulariter lobatis, lobis nonnullis apice rotundatis subintegrisque, ceterum margine profunde dentata et laciniata, dentibus lacinulisque saepe 1–10 mm longis, 0.3–0.8 (-1) mm latis, simplicibus aut furcatis, sat acutis aut apice angustato, planis aut superne convexis, sat laxe affixus, lobis saepe partim contortis at plus minusve imbricatis adscendentibusve, ceterum sat laevigatus, margine passim parce aut sat parce ciliato, ciliis 3–0.5 mm longis, nigris, simplicibus, sorediis et isidiis destitutus, subtus rhizinis brevibus, nigris passim parcissime instructus, KHO superne lutescens, intus leviter lutescens, $CaCl_2O_2$ non reagens, at his solutionibus unitis intus leviter rubescens. Apothecia mediocria, circ. 5–8 mm lata cupuliformia, subpedicellata aut sessilia, imperforata aut raro demum minute perforata, disco rufo aut testaceo-rufescente, nudo, opaco aut nitido, margine tenui, minute papilloso-denticulato aut parce lacinulato, haud ciliato, excipulo subtus sat laevigato aut leviter ruguloso. Hymenium circ. 0.1 mm crassum, ascis solis jodo caerulescentibus. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, long. 0.019–0.030, crass. 0.011–0.017 mm, membrana 0.003 mm crassa, exosporio et endosporio sat distincto, apicibus rotundatis. Conceptacula pycnoconidiorum thallo ambitum versus immersa, apice atro parum emergente. Pycnoconidia haud bene cognita (unum subbifusiforme, rectum, long. 0.007, crass. 0.0007 mm, inter sterigmata male evoluta vidi). Habitu similis est *P. disparili* Nyl., quae lacinulis subtus albidis et medulla $CaCl_2O_2$ non reagente et thallo ciliis destituto secundum specimen orig. n. 35103 in herb. Nyl. ab ea disinguitur.

Luzon, prov. Zambales, *Bur. Sci. 5156 Ramos, For. Bur. 8177 Curran & Merritt:* prov. Benguet, mons Tonglon, *Bur. Sci. 5493 Ramos.* Mindoro, mons Halcon, *Merrill 6163,* alt. 2400 m s. m. Ad truncos. Fert.

6. **P. coralloidea** (Mey. & Flot.) Wain. Étud. Lich. Brés. 1: 33.

Thallus isidiosus, medulla alba, KHO non reagente, $CaCl_2O_2$ rubescente.

Mindanao, Castra Keithley prope lacum Lanao, cum *Clemens 1319.* Ad truncum arboris. Ster.

7. **P. latissima** Fée var. **cristifera** (Tayl.) Hue.

Thallus ciliis destitutus, intus KHO lutescens, dein rubescens.

MINDANAO, prov. Davao, *Copeland 1219*. Ad truncum arboris. Ster.

8. **P. Clandelii** (Harm.) Wain. in Schmidt Fl. Koh Chang Lich. (1909) 337.

Var. **Clemensæ** Wain. var. nov.

Thallo subtus late denudato, passim rhizinis brevibus et papillis crebris instructo et margine parcissime ciliato a *P. Clandelii* differens et ad *P. latissimam* accedens. Thallus margine sorediosus, KHO superne lutescens, intus lutescens, dein rubescens. Apothecia cupuliformia, breviter pedicellata, imperforata, disco testaceo, nudo, margine subintegro aut crenato, ciliis destituto, excipulo subtus laevigato, soredioso (sporis haud juvenilibus). Pycnoconidia lageniformi-subfusiformia aut parce subbifusiformia, recta, long. 0.007–0.005, crass. 0.0007 mm.

MINDANAO, Castra Keithley prope lacum Lanao, *Clemens 1319, 1314 p. p., 1328 p. p.* Ad truncos arborum. Fert.

9. **P. (Irregularis) cetrata** Ach.

MINDANAO, prov. Davao, mons Apo, *Copeland 1090 p. p.*, alt. 1800 m s. m. Ad truncum arboris. Ster.

10. **P. manilensis** Wain. sp. nov.

Thallus albidus aut glaucescenti-albidus, intus albus, inferne niger, laciniis circ. 8–3 mm latis, inaequaliter dilatatis, basi vulgo valde angustatis, irregulariter inaequaliterque lacinulatis, apice rotundato-dilatato aut anguloso-lacinulato angustatoque, adpresso aut leviter adscendente, sorediis et isidiis destitutus, vulgo sat laevigatus, cortice continuo aut centrum versus fortuito rimosus, subtus partim rugulosus, usque ad marginem rhizinis crebris, sat brevibus, 0.5–0.7 mm longis, nigris, saepe ramulosis, tenuibus instructus, KHO superne lutescens et demum fulvescens, intus non reagens, $CaCl_2O_2$ non reagens, his solutionibus unitis intus non reagens. Apothecia numerosa et partim crebra mediocria aut minora, circ. 3.5–2 mm lata, primum cupuliformia, dein applanata peltataque, basi bene constricta, sessilia, imperforata, disco rufo, nudo, nitido, margine sat tenui, diu involuto, subintegro aut leviter fisso, ciliis destituto, excipulo extus laevigato. Paraphyses increbre ramoso-connexae, tubulis tenuibus, membranis gelatinoso-incrassatis, ceterum indistincte limitatis, at apicibus rufescenti-clavatis distincte limitatis. Epithecium rufescens, gelatina cuticulari fere decolore. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, apicibus rotundatis, membrana 0.001 mm crassa, long. 0.02–0.013, crass. 0.01–007 mm. Jodo asci soli caerulescentes. *P. macrocarpoides* Wain. apotheciis subpedicellatis et vulgo perforatis, *P. subtiliacea* Nyl. rhizinis parcis et thallo superne calcareo-glaucescente et *P. fecunda* Hue sporis minoribus ab hac specie differunt.

LUZON, prov. Benguet, mons Tonglon, *Bur. Sci. 5482a Ramos.* Ad saxa. Fert.

11. **P. Hookeri** Tayl. in Hook. Journ. Bot. (1847) 169; Wain. Cat. Welw. Afr. Pl. Lich. (1901) 400.

Thallus isidiosus, KHO superne lutescens, intus lutescens et demum rubescens, $CaCl_2O_2$ non reagens. *P. meiphora* Nyl. Lich. Guin. 45, thallo majore ab hac specie differt.

Luzon, prov. Benguet, Baguio, *For. Bur. 15626 Curran.* Ad truncum *Pini insularis* Endl. Ster.

12. **P.** (sect. **Sublinearis**) **americana** (Mey. & Flot.) Mont.; Wain. Lich. Nov. Rar. I, Hedwigia (1899) 122.

Thallus subtus margine fibrillosus, ceterum glaber, superne isidiosus, sorediis destitutus, KHO superne lutescens, intus primum lutescens, dein rubescens.

Luzon, prov. Benguet, Baguio, *For. Bur. 15625 Curran.* Ad truncum *Pini insularis* Endl.; mons Tonglon, *Bur. Sci. 5484 Ramos*, in rupe. Ster.

13. **P. sorocheila** Wain. Lich. Nov. Rar. I, Hedwigia (1899) 123.

Thallus subtus margine fibrillosus, ceterum subtus glaber, isidiis destitutus, partim in apice et parce etiam in margine laciniarum soraliis rotundatis instructus, KHO superne flavescens, intus primum lutescens, dein rubescens.

Luzon, prov. Lepanto, mons Data, *Merrill 4945*, alt. 2100 m s. m. Ad truncos *Pini insularis* Endl. Ster.

14. **P. subdissecta** Nyl. Fl. (1882) 452; Nyl. & Cromb. in Journ. Bot. (1882) 51.

Thallus albidus, adpressus, isidiis minutissimis passim parce instructus, sorediis et ciliis destitutus crebre iteratim dichotome ramosus, laciniis sublinearibus, 1–0.3 mm latis, apicibus obtusis aut truncatis retusisve, KHO superne lutescens, intus non reagens, $CaCl_2O_2$ non reagens, at his solutionibus unitis intus rubescens. Apothecia peltata applanataque, adpressa, sessilia, disco rufo, nudo, nitido, plano aut leviter concavo, margine sat tenui, leviter crenulato, excipulo subtus laevigato, isidiis destituta. Hymenium 0.035–0.04 mm crassum, praesertim ascis jodo caerulescentibus. Epithecium testaceo-rufescens. Paraphyses crebre-septatae, tubulis mediocribus, 0.002–0.0025 mm crassis, apice parum incrassatis, membranis parum gelatinoso-incrassatis. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, apicibus rotundatis, long. 0.005–0.01, crass. 0.003–0.0005 mm. *P. dissecta* Nyl. apotheciis vulgo cupuliformibus, excipulo isidioso et sporis majoribus ab hac specie differt.

Luzon, prov. Benguet, Baguio, *For. Bur. 15632 Curran.* Ad truncos *Pini insularis* Endl. Fert.

15. **P.** (div. **Endoxantha**) **biformis** Wain. sp. nov.

Thallus stramineo-glaucescens aut partim cinereo- aut pallido-glaucescens, medulla flava aut straminea aut partim stramineo-albida, subtus nigricans aut ad ambitum anguste aut late pallidus vel castaneus, laciniis biformibus, aliis latis, latitudine usque ad 5 mm, sicut in *P. tiliacea*

rotundato-lobatis crenatisve, inaequaliter dilatatis, aliis angustis, circ. 0.3–0.7 mm latis, sicut in *P. laevigata* sublinearibus, crebre iteratim dichotome ramosis, apicibus truncatis aut obtusis, partim adpressus, partim apicibus recurvis adscendentibus, saepe etiam laciniis imbricatis, sat laevigatus, leviter nitidus aut opacus, isidiis et sorediis destitutus, subtus fere usque ad marginem rhizinis crebris, 1.5–0.5 mm longis, nigris, simplicibus aut parcius etiam leviter ramulosis, tenuibus instructus, KHO superne haud reagens aut leviter flavescens, intus lutescens et demum aurantiaco-rubescens (forma *pauaiensis*) aut aurantiaco-fulvescens (forma *dataensis*), partibus intus subalbidis haud reagentibus, $CaCl_2O_2$ non reagens. Apothecia minora aut parva, 2.5–0.7 mm lata, peltata applanataque, sessilia, tenuia, imperforata, disco rufo aut testaceo-rufescente, nudo, sat opaco, margine tenuissimo, subintegro aut leviter crenulato, excipulo extus laevigato, interdum pycnoconidangiis instructo. Hymenium circ. 0.05 mm crassum, jodo caerulescens aut partim ascis solis caerulescentibus. Epithecium testaceo-rufescens, gelatina cuticulari passim pallidiore. Paraphyses tubulis sat tenuibus, apice paullo crassioribus, membranis gelatinoso-incrassatis, usque ad apicem indistincte limitatis. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, apicibus rotundatis, membrana vix 0.001 mm crassa, long. 0.014–0.01, crass. 0.008–0.006 mm. *P. denegans* Nyl. Lich. Ceyl. (1900) 6, secundum specimen orig. n. 35129 in herb. Nyl. thallo soridiis et isidiis destituto et medulla straminea instructa, facie externa huic speciei omnino similis est, at secundum annotationem Nylanderi thallo KHO haud reagente et sporis brevioribus ab ea differt. *P. endochlora* Leight. Lich. Ceyl. (1870) 140, secundum specimen orig. n. 35077 in herb. Nyl. item his est similis, at observante Nyl. tantum extus KHO reagens.

Forma **pauaiensis** Wain.

LUZON, prov. Benguet, Pauai, *Bur. Sci. 4434 Mearns*, alt. 2100 m s. m. Ad truncum arboris. Ster.

Forma **dataensis** Wain.

LUZON, prov. Lepanto, mons Data, *Merrill 4987*, alt. 2100 m s. m. Ad truncum arboris. Fert.

Trib. 2. STEREOCAULEAE.

1. STEREOCAULON Schreb.

1. **S. nesaeum** Nyl.

Var. **zeorina** Wain.

Perithecium ex hyphis radiantibus, pachydermaticis, conglutinatis formatum, semipellucidum, in margine anguste denudatum, ceterum amphithecio thallino, gonidia continente, obductum. Pars intima axis chondroidei et partes exteriores pseudopodetiorum KHO lutescentes. Apothecia KHO lutescentia, hymenium et hypothecium KHO demum aurantiaco-rubescentia. Amphithecium ex hyphis crassis, pachydermaticis, irregulariter contextis, aëre disjunctis aut partim in superficie excipuli

conglutinatis, et ex hyphis tenuibus leptodermaticis, gonidia obducentibus, formatum. Hypothecium pallidum, strato medullari ex hyphis irregulariter contextis, leptodermaticis, conglutinatis formato, impositum. Sporae aciculares, longissimae, spiraliter contortae, multiseptatae. Cephalodia sessilia, foveolato-rugosa, gonidia scytonemea, filamenta 0.01–0.013 mm crassa, cellulis 0.007–0.008 mm crassis, in serie simplice concatenatis formantia, parce continentia. Pycnoconidia aciculari-fusiformia, medio leviter incrassata, apicibus attenuatis tenuissimisque, leviter curvata, long. 0.008–0.01, crass. 0.0007–0.001 mm.

LUZON, prov. Benguet, mons Tonglon (Santo Tomas), *Elmer 6544;* Pauai, *Merrill 4926,* alt. 2100 m s. m.: prov. Lepanto, Balili, *Merrill 4879:* prov. Zambales, mons Pinatubo, *Bur. Sci. 2577 Foxworthy.* Ad saxa. Fert.

Var. **lecideoides** Wain.

Perithecium primum amphithecio thallino obductum, demum late denudatum. Ceterum pseudopodetia et apothecia et eorum reactiones sicut in var. *zeorina.* Amphithecium thallinum apotheciorum demum saepe gonidiis destitutum. Hymenium et hypothecium KHO demum aurantiaco-rubescentia.

LUZON, prov. Benguet, Baguio, *Merrill 4866;* mons Tonglon, *Bur. Sci. 5477 Ramos:* prov. Bataan, mons Mariveles, *Merrill 3561.* MINDANAO, prov. Misamis, mons Malindang, *For. Bur. 4806 Mearns & Hutchinson.* Ad saxa. Fert.

2. **S. graminosum** Schaer. in Moritzi Syst. Verz. Zolling. Jav. Pflanz. (1845–46) 127; Zolling. Syst. Verz. (1854) 6; Mont. & v. d. Bosch Lich. Jav. (1856) 28.

S. turgescens Nyl. Syn. Lich. 248; Lich. Ins. Guin. 43.

Pseudopodetia KHO neque superne nec intus reagentia, at verruculae phyllocladoideae KHO lutescentes. Apothecia lecideina, subtus fuscentia. In *S. alpina* Laur. verruculae phyllocladoideae majores et apothecia zeorina, subtus strato tomentoso, thallo concolore obducta. Etiam in *S. tomentosa* Laur. apothecia zeorina.

LUZON, prov. Zambales, mons Pinatubo, *Bur. Sci. 2545 Foxworthy:* prov. Laguna, mons Banajao, *For. Bur. 7984 Curran & Merritt.* Ad saxa. Fert.

3. **S. arbuscula** Nyl. Prodr. Fl. Nov. Gran. ed. 2 (Ann. Sc. Nat. Bot. IV **19** (1863) 12).

S. nanum var. *arbuscula* Nyl. Enum. Gen. Lich. (1857) 97.
Leprocaulon arbuscula Nyl. Lich. Ins. Guin. 8.

Ramuli phyllocladoidei applanati, KHO non reagentes. Pseudopodetia basi emorientia et apice postea adhuc diu accrescentia.

LUZON, prov. Lepanto, mons Data, *Merrill 4958,* alt. 2100 m s. m. Supra muscos in rupe. Ster.

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VOL. IV DECEMBER, 1909 No. 6

NOTES ON PHILIPPINE ORCHIDS WITH DESCRIPTIONS OF NEW SPECIES, II.[1]

By OAKES AMES.

(From the Ames Botanical Laboratory, North Easton, Mass., U. S. A.)

In the following notes I have arranged the genera according to the system adopted by Pfitzer in Engler and Prantl's "Die natürlichen Pflanzenfamilien." The species included were, with few exceptions, collected for the Bureau of Science. In all thirty-one species are treated of which twenty-two are additions to my previously published lists of Philippine orchids.

EPIPACTIS Boehmer.

Epipactis clausa A. A. Eaton ex Ames Orchidaceae 3 (1908) 41, *pl. 38.*

In addition to the solitary specimen which constitutes the type, preserved in the herbarium of the Bureau of Science, I have now seen two sets of specimens which make possible the following emendations of the description published in Fascicle III of "Orchidaceae":

Lateral sepals broadly ovate to ovate-lanceolate, 4 mm long. *Upper sepal* similar to the laterals and nearly equal to them, strongly reflexed at the tip. *Petals* dolabriform, 4 mm long. *Labellum* 2.5 to 3 mm long, saccate, somewhat cymbiform, obtuse, with unequal clavate hairs or emergences inside.

The plants exceed 2 dm in height and arise from a creeping, fleshy rhizome. The leaves, about four in number, 4 cm apart, on the succulent stem, appear to have been dark-green when fresh, ornamented with whitish nerves. The margins of the leaves in dried specimens are usually strongly crenulate and in fresh

[1] Proof corrected by E. D. Merrill and C. B. Robinson.

material it is highly probable that this character is a peculiarity of the species.

When the plants mature their fruit, the racemes enlarge in diameter and the slender raceme represented in "Orchidaceae" Fasc. III is hardly characteristic. Notes made by the collectors indicate that the flowers are white.

According to Mr. Eaton's notes, *E. clausa* is nearly related to *E. pusilla*, from which it differs in its broader petals and deeply cymbiform but not saccate labellum.

LUZON, District of Lepanto, Mount Data, *Merrill 4591*, October 29, 1905, terrestrial in the mossy forest at an altitude of about 2,200 m: Province of Benguet, Mount Santo Tomas, *R. S. Williams 1922*, October 30, 1904.

The specimens gathered by Williams are in fruit, and are preserved in the herbarium of the New York Botanical Garden.

Epipactis rubicunda (Bl.) A. A. Eaton in Proc. Biol. Soc. Wash. 21 (1908) 65.

Of this species there are two specimens in the herbarium of the Bureau of Science which A. A. Eaton identified as *E. rubicunda*. In accordance with the rules of priority and in conformity with the articles of the Vienna code governing nomenclature, Eaton referred to the genus *Epipactis* all the species formerly grouped under *Goodyera*, asserting that the name *Epipactis* appears to have been first used by Boehmer in the third edition of Ludwig's "Definitiones Generum Plantarum." Although Boehmer published no binomial combination he gave several references to the plant designated by Linnaeus as *Satyrium repens*, now generally known as *Goodyera repens* R. Br. or *Peramium repens* Salisb.

The specimens of *Epipactis rubicunda* already referred to are showy plants with elliptic, acuminate leaves nearly 1.5 dm long and with channeled petioles, 3 to 6.5 cm long, which clasp the stems.

The inflorescence is rather densely many-flowered, 1.8 to 3 dm long. The pubescent flowers are about 8 mm long, nearly exceeded by the narrowly lanceolate, pubescent, acute floral bracts.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, September, October, 1906. LUZON, Province of Laguna, *Bur. Sci. 6049 Robinson*, March 5–11, 1908.

For a detailed account of Eaton's reasons for taking up the name *Epipactis* for the species formerly referred to *Goodyera*, his paper cited above should be consulted. The species formerly included in *Epipactis* are placed by Eaton in *Serapias*.

COELOGYNE Lindl.

Coelogyne Rochussenii De Vriese Illustr. Orchid. Indes Oriental. (1854) *t. 2; t. 11, f. VI.*

This species is represented in the herbarium of the Bureau of Science by a single specimen. The leaf is broadly lanceolate or elliptic, acuminate, conspicuously nerved. The lamina is 2.5 dm long, 11 cm wide; the slender petiole exceeds 5 cm in length. The flowers are produced in elongated, flexuose racemes. A scarious elliptic bract, 1.8 cm long, subtends each flower. The sepals and petals are narrowly lanceolate, about 2.5 cm long. The labellum up to the base of the middle lobe is provided with three denticulate carinæ, and beyond the base of the middle lobe two additional, abbreviated carinæ arise. The middle lobe is acuminate.

Although *C. Rochussenii* is referred to the § *Tomentosae* in Pfitzer's monograph of the *Coelogyninae*, the material at hand is sparsely furfuraceous and, with the exception of the ovaries, nearly smooth.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, September, 1907. Flowers yellowish, hillside forests. This species has not hitherto been reported from the Philippines.

Coelogyne integerrima sp. nov.

Aff. *C. cinnamomeae*. *Pseudobulbi* plus minus 6 cm longi, ovoidei, diphylli. *Folia* lanceolata, acuminata, valde 3- ad 5-nervia, plus minus 2 dm longa, circa 3.5 cm lata. *Pedunculus* erectus plus minus 30 cm longus. *Racemus* laxus, bracteis jam dejectis. *Sepala lateralia* carinata, lanceolata, acuta, 2.5 cm longa, 9 mm lata. *Sepalum dorsale* simile. *Petala* linearia, acuta, 3-nervia, 2.5 cm longa, 5 mm lata. *Labellum* integerrimum, oblanceolatum, acuminatum, 2.4 cm longum, 1 cm latum, prope apicem in disco carinae 3.

Coelogyne integerrima belongs to the § *Carinatae* and appears to be closely allied to *C. cinnamomea*, from which it differs in its larger flowers and entire labellum. The leaves are much broader in relation to their length than those of *C. cinnamomea*. The labellum is entire, without lobes. The keels on the disc are smooth and extend from the base to the tip, the lateral ones being more prominent near the middle.

LUZON, Province of Benguet, Mount Pulog, *Merrill 6350*, May, 1909, in the lower mossy forest, altitude about 2,200 m. Flowers greenish-yellow.

PHOLIDOTA Lindl.

Pholidota ventricosa (Bl.) Reichb. f. in Bonplandia 5 (1857) 43.

Dr. Kränzlin has described *Pholidota sesquitorta*, a species which is very close to *P. ventricosa*. J. J. Smith considers them conspecific. In the key to the species of *Eupholidota* in Engler's "Pflanzenreich," *P. ventricosa* is distinguished from *P. sesquitorta* by means of the floral bracts, which exceed the flowers in the former, and in the latter are usually shorter than the flowers. The material which I refer to *P. ventricosa*, including the specimen cited in "Orchidaceae" Fasc. II, has floral bracts which are about equal to the flowers. The key in "Das Pflanzenreich" distinguishes the bracts of *P. ventricosa* by their tips; these being obtuse. In my material the bracts are acute. The description of *P. ventricosa*, in "Das Pflanzenreich" however, says "acutae." The type of *Pholidota ventricosa* in the Leiden Herbarium lacks flowers, so that it is quite difficult to tell much about it except for the analysis published by Blume in his "Tabellen." On the type only the leaves and a naked peduncle remain. On the same sheet with the type a good specimen is mounted which J. J. Smith has identified as *P. ventricosa*. The material I have studied agrees very well with this specimen.

Until the status of *P. sesquitorta* is finally established, I am of the opinion that the Philippine material should be referred to *P. ventricosa*.

LUZON, District of Lepanto, *For. Bur. 5715 Klemme*, October, November, 1906. MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, February, 1907.

DENDROCHILUM Blume.

Dendrochilum anfractoides Ames Orchidaceae 3 (1908) 13, *pl. 28*.

Another specimen of this rare species has come to hand which exhibits all the characters that were referred to in the original description as of value in separating it from *Dendrochilum anfractum*. The middle lobe of the labellum is conspicuously tridentate, the lateral teeth being fleshy and almost like marginal

calli at the base of the membranaceous deflexed middle tooth. The lateral lobes are setaceous, and, when in their normal position, strongly curved upward at the tip. The calli at the base of the labellum are peculiar in that they are linear and curved, not like papillæ. The leaves in the present specimen are scarcely 4 cm long and about equal in length to the naked part of the peduncle.

LUZON, Province of Benguet, Pauai, *Bur. Sci. 4312a Mearns*, July, 1907.

CESTICHIS Thou.

Cestichis Clemensiae sp. nov.

Aff. *C. vestitae* Ames. *Planta* parvula, erecta. *Caules* 3 ad 6 cm alti. *Folia* 2, oblonga, obtusa, 5.8 cm longa, circa 1 cm lata, coriacea, rigida. *Racemus* circa 8 cm longus. *Bracteae inflorescentiae* lineari-lanceolatae, acutae, pedicellis breviores. *Sepala lateralia* oblonga vel elliptica, obtusa, 2 mm longa. *Sepalum dorsale* simile. *Petala* linearia, 2 mm longa. *Labellum* lanceolatum, 2 mm longum, ad apicem valde retusum vel bidentatum. *Columna* arcuata.

C. Clemensiae appears to be a near affinity of *C. vestita* which is a more robust species with much larger leaves and flowers. It is also closely related to *Liparis confusa* J. J. Smith, from which it is readily distinguished by its smaller stems and leaves and by its smaller flowers. The lips of *C. vestita*, *Liparis confusa*, and *C. Clemensiae* are very similar. These species are most easily recognized by the differences in their vegetative parts. It may be that they represent forms of a polymorphic species, but until more material has been studied with this suggestion in mind they should be regarded as distinct from one another. I have seen six plants of *C. Clemensiae*.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens 129*, February, 1906.

OBERONIA Lindl.

Oberonia aporophylla Reichb. f. Bonplandia 3 (1855) 223.

In my second list of the orchids collected in the Philippines for the Bureau of Science this species was included. The material on which determination was attempted consisted of fruiting specimens. Since the publication of Fascicle II of "Orchidaceae" more material has come to hand in which the flowers are in excellent condition for study. The labellum, petals, and sepals agree perfectly with the sketch of a flower of *O. aporophylla* in Lindley's herbarium at Kew, and the habit of the plant is like that of the material, numbered 2113, collected in the Philippines by Cuming. *O. aporophylla* is a slender caulescent species about 2 dm tall with from 10 to 20, triangular, acute, obliquely ascending leaves which are about 2 cm long. The leafy stem terminates in a slender, rather loosely flowered, spicate raceme about 1 dm long. The labellum is subpandurate, emarginate, somewhat auriculate on each side at base, 1.5 mm long, the terminal portion is finely toothed. The petals are linear.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens 699*, September, October, 1906.

POLYSTACHYA Lindl.

Polystachya luteola Hooker Exotic Flora 2: *t. 103.*

I have seen a single plant of this species from Mindanao. In every detail its vegetative and floral parts agree with specimens in my herbarium from Florida, U. S. A., and from Cuba. Flowers from a plant collected near Miami, Florida, when moistened in water and laid beside flowers from the Philippines resembled them so closely that it was quite impossible to distinguish between them by any

evident characteristic. The neuration, the form of the sepals and petals, and the outline of the labellum proved similar in both.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, September, October, 1907.

PODOCHILUS Blume.

Podochilus Clemensiae sp. nov.

Planta 4 dm alta vel etiam altior, gracilis. *Folia* linearia, disticha, 4 ad 6 cm longa, 4 ad 6 mm lata, obtusa, ad apicem inaequaliter bilobata cuspidata. *Flores* circa 20, distichi, in racemis laxis ex axillis foliorum emergentibus. *Racemus* 2.5 ad 3 cm longus. *Bracteae inflorescentiae* lanceolatae, acutae, ovariis breviores, 2 mm longae. *Sepala lateralia* ovata, acuta vel subobtusa, 3 ad 3.5 mm longa, 2 mm lata. *Sepalum dorsale* ovato-lanceolatum, lateralibus brevius. *Petala* oblonga, obtusa vel subtruncata, circa 2 mm longa, 1 mm lata. *Labellum* cuneatum, obtusum, 2 mm longum. *Columna* brevissima.

Podochilus Clemensiae is a slender, extremely graceful species which suggests *P. pendulus* in habit, although the leaves are narrower in relation to their length than those of *P. pendulus* and longer than the racemes. The labellum resembles that of *P. lancifolius*, but is entire, and the membrane at the base which forms a pocket or cup is very strongly developed and extends nearly to the middle of the labellum. Although the racemes are prevailingly axillary, they are sometimes, perhaps frequently, terminal. The material at hand is very copiously flowered.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, September, 1907.

Podochilus crotalinus sp. nov.

Glaberrimus, erectus (?), circa 3 dm altus, pluricaulis; *foliis* distichis, lineari-oblongis, ad vaginam articulatis, bilobulatis, nervo intermedio in apiculum setiforme minutum producto, basi vix attenuatis, 1 ad 2 cm longis, medio 3 ad 5 mm latis; *spica* terminale, disticha, multiflora, 2.3 cm longa; *bracteis* lanceolato-ellipticis, 8 ad 10 mm longis, *flores* plus minusve excedentibus; *sepalis lateralibus* valde obliquis, acuminatis, trinerviis, 6 mm longis; *sepalo intermedio* ovato; *petalis* lineari-oblongis obtusis, sepalis paulo brevioribus; *labello* 5 mm longo, circuito oblongo supra medio dilatato obscure trilobato.

In the specimens examined the flowers are old and badly shrivelled so that the form of the labellum is difficult to observe. The basal half is almost rotund, slightly concave, the apical half is subflabelliform and apparently truncate. Near the point of origin of the apical lobe or half there are two thickened lines. The extreme base of the lip resembles that of *P. distichus* Schlechter. The floral bracts, which are scarious and so arranged as to resemble the rattles of *Crotalus horridus*, are elliptic-lanceolate or ovate, about 6 mm wide near the base and at the apex subobtuse, scarcely acute, and obscurely, if at all, cuspidate. The distichous inflorescence is from 1.8 to 2 cm wide in its greatest diameter. The nearest affinity of *P. crotalinus* is *P. distichus* Schlechter. The form of the inflorescence, however, and the very broad floral bracts are differentiating characters.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, November, 1906.

Podochilus Cumingii Schlechter in Fedde's Repertorium 3 (1907) 19.

I refer here specimens gathered in Mindanao and Luzon. The mentum formed by the lateral sepals is deeply saccate. The labellum is lanceolate and at the base where it joins the slender claw produced into a subquadrate appendage. This appendage is truncate and not at all emarginate or bifid. Hooker's description of *P. microphyllus* Lindl. in the "Flora of British India" agrees in detail with my material except for the height of the plants which in Hooker's material is greater than in mine. Schlechter refers the species described by Hooker to *P. sciuroides*. *P. sciuroides* appears to be closely related to *P. Cumingii*. In his monograph of the *Podochilinae* Schlechter describes the labellum of *P. Cumingii* as 5-nerved. My material has the labellum 3-nerved with the lateral nerves branched. Schlechter describes the labellum of *P. sciuroides* as 3-nerved with the laterals branched. *P. sciuroides* is a taller species than *P. Cumingii*. In the specimens from Mindanao the stems are rarely more than 1 dm long. For the present it seems best to adopt for the Philippine species the name proposed by Schlechter.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, September, 1907. LUZON, Province of Bataan, Mount Mariveles, *Copeland s. n.*, November 23, 1907, in moss on trees, flowers white; *Bur. Sci. 1678 Foxworthy*, October 17, 1906: Province of Pampanga, Mount Arayat, *Merrill 4260*, September 15, 1905, epiphyte on mossy trees at an altitude of 820 m.

Although the flowers are described as white by the collectors, they appear, when dried, to have been tinged with purple.

Schlechter, in his monograph, does not use the name *P. Cumingii*. In the "Repertorium" *l. c.*, however, he asserts that the Philippine plant referred to *P. Zollingeri* in his monograph constitutes a new species for which he proposes the name *P. Cumingii*.

Podochilus plumosus sp. nov.

Planta parvula, glabra, plumosa, simplex. *Folia* disticha, linearia, circa 1 cm longa, 1 mm lata, acuta, approximata. *Flores terminales* et *laterales*. *Pedunculus* folio brevior. *Bracteae inflorescentiae* imbricatae. *Sepala lateralia* lanceolata, acuta, 1-nervia, circa 3 mm longa. *Sepalum dorsale* ovato-lanceolatum, acutum, 1-nervium. *Petala* oblanceolata vel elliptica, subacuta vel obtusa, 1-nervia, 2 mm longa, 1 mm lata. *Labellum* rhombicum, ad basim sagittatum, 3 mm longum, 2 mm latum. *Rostellum* quadridentatum. Capsula 6 mm longa.

P. plumosus is a graceful species, the leafy stems of which have the appearance of feathers and suggest the leaves of *Taxodium distichum*. The flowers are produced singly on short peduncles which are almost completely hidden by scarious imbricating bracts. The labellum is rhombic above the sagittate base and hardly acute at the apex. *P. plumosus* belongs doubtfully to § *Apista*. Doubtfully, because according to Schlechter's remarks § *Apista* is always characterized by having the inflorescence terminal. Our species is hardly a member of § *Appendicula* and probably forms a transition between it and § *Apista*, having all the characters of the latter group and in addition a lateral as well as a terminal inflorescence.

From *P. Cumingii*, *P. plumosus* is readily distinguished by the more slender, longer leaves and by the very different inflorescence, as well as by the position of the flowers.

LUZON, Province of Zambales, Mount Tapulao, *Bur. Sci. 4763 Ramos*, December, 1907, *Bur. Sci. 3986 Curran* (flowered in orchid house, Manila, March, 1908): Province of Tayabas (Infanta), *Whitford 803*, September 11, 1904, on rocks and trees along the Tinuan River, altitude about 80 m.

Podochilus strictus sp. nov.

Caules 1 ad 2 dm alti. *Folia* disticha, linearia, apiculata, 11 mm longa, circa 1 mm lata. *Pedunculus* terminalis. *Racemus* usque 5 ad 10 mm longus. *Bracteae inflorescentiae* lanceolatae, acutae, 1 mm longae. *Flores* 2.5 ad 3 mm longi. *Sepalum dorsale* lanceolatum, subacutum, concavum, 1-nervium, usque ad 3 mm longum. *Sepala lateralia* ovato-lanceolata, acuta. *Petala* lanceolata, 1-nervia, obtusa, circa 2.5 mm longa, 1 mm lata. *Labellum* supra medium circa 1 mm latum, breviter unguiculatum, subquadratum, 3-nervium, obtusum, prope basim sagittatum vel auriculatum. *Rostellum* bipartitum.

Podochilus strictus is a slender species which appears to be very near *P. microphyllus* Lindl. and *P. bicaudatus* Schlechter. The racemes, which are clothed at the base with several imbricating scarious bracts, are comparatively many-flowered, with rigid, distichous, cymbiform floral bracts. In dried specimens, the leaves, which are directed obliquely upwards, are sometimes twisted and consequently give the plant a very strict appearance. Near the summit of the stems, lateral growths arise which produce roots at the point of origin.

I have not seen the type specimen of *Podochilus bicaudatus* but according to Schlechter's description that species differs from *P. strictus* in its shorter leaves, smaller, fewer flowers and shorter racemes. *Podochilus acicularis* Hooker f., which Schlechter refers to *P. tenuis*, is similar to *P. strictus*, but has a very different lip from that species and a very different habit (cf. Hooker's "Icones Plantarum" *pl. 2147*).

MINDANAO, Lake Lanao, Camp Keithley, *Bur. Sci. 3002 Mrs. Lyon* (specimen flowering in orchid house, Manila, January, 1906), *Mrs. Clemens 132:* District of Zamboanga, *For. Bur. 9193 Whitford & Hutchinson*, December 12, 1907.

Podochilus bicaudatus Schlechter in Fedde's Repertorium 3 (1907) 19.

In the herbarium of the Bureau of Science there is a single specimen collected by Elmer D. Merrill in February, 1903, on the Island of Paragua which may prove to be conspecific with *Podochilus bicaudatus*. Unfortunately only one flower was preserved on this specimen and that one, imperfect to begin with, was destroyed by dissection. The leaves are 5 mm long, twisted when dry, linear, acuminate. They agree perfectly with Schlechter's description in Fedde's "Repertorium." In general habit the plant resembles *P. tenuis* as illustrated in Hooker's "Icones Plantarum" (*pl. 2147*) but is not so stout nor so tall. The labellum is oblong, obtuse, sagittate at base, and measures 2 mm in length. The specimen collected by Merrill is numbered 775.

AGROSTOPHYLLUM Blume.

Agrostophyllum philippinense sp. nov.

Aff. *A. papuano* Schltr. et *A. formosano* Rolfe. *Habitu* simile *A. majori* Hook. f. *Caules* aliquid compressi. *Planta* 5 dm alta. *Folia* disticha oblongi-lanceolata, obtusa, plus minus 1.5 dm longa, prope basim plus minus 2.5 cm lata. *Inflorescentia* capitata, circa 4 cm lata, densa. *Sepala lateralia* 3-nervia, oblonga, acuta, 5 mm longa, 2 mm lata. *Sepalum dorsale* valde concavum, 4 mm longum. *Petala* ovata, subacuta, 4 mm longa, 2 mm lata. *Labellum* 4.5 mm longum, ad basim concavum

vel ventricoso-saccatum, antice in lamella cordiformi instructum. *Columna* clavata, 4 mm longa.

Agrostophyllum philippinense is perplexingly near *A. majus* Hook. f., but differs from it among other characters in its petals and longer leaves. It is also near *A. papuanum* Schlechter, but has the leaves longer in relation to their width, and larger heads of flowers. According to Mr. Rolfe's description in the "Annals of Botany" **9**: 157, it must be closely allied to *A. formosanum*. The labellum resembles closely that of *A. majus* but the epichil is cordate. J. J. Smith refers *A. majus* to *A. longifolium* Reichb. f. In my herbarium there is an excellent photograph of a specimen preserved in the herbarium at Leiden which is labeled *Appendicula longifolia* Bl. This specimen has narrower, longer leaves and a smaller inflorescence than my Philippine specimens. Further study may show that *Agrostophyllum philippinense* is merely a form of *A. majus*, and that both should be referred to the older *A. longifolium*. For the present, however, I believe that the Philippine species should be regarded as distinct from *A. majus* and *A. longifolium*.

LUZON, Province of Bataan, Mount Mariveles, *For. Bur. 1900 Borden*, September 16, 1904, on trees, rocky mountain ridge, altitude about 1,000 m, "corolla cream-white, lip whiter, no odor:" Province of Rizal, Mount Batay, *Loher 6020* (specimen flowering in Manila).

CERATOSTYLIS Blume.

Ceratostylis rubra sp. nov.

Aff. *C. grandiflorae* J. J. Smith. *Planta* robusta. *Caulis* ramosus plus minus 4 dm longus, *bracteis* chartaceis, imbricatis, arcte vaginantibus, dense vestitus. *Folia* coriacea, rigida, linearia, ad apicem bilobata, plus minus 1 dm longa, circa 5 mm lata. *Sepala lateralia* oblongi-lanceolata, acuta, 7-nervia, membranacea, mentum obtusum formantia, ad basim cohaerentia, 2 cm longa, 4 mm lata. *Sepalum dorsale* oblongum, 1.7 cm longum, circa 5 mm latum. *Petala* oblanceolata, subacuta, 7-nervia, 1.9 mm longa, prope apicem 4.5 mm lata. *Labellum* lanceolatum, acuminatum, 3-nervium, 8 mm longum. *Gynostemium* 5 mm longum, brachiis magnis, rotundatis.

Ceratostylis rubra is perhaps most nearly allied to *C. grandiflora* J. J. Smith. From that species it differs in the form of the leaves, in its labellum, which is lanceolate-acuminate or acuminate from a rounded base, and in the nerves of the sepals and petals. For the genus the flowers are extraordinarily large and according to the collectors' notes and dried specimens are red. In a photograph of living specimens cultivated at Manila the leaves appear to be thick, fleshy, recurved, and on the upper surface strongly channeled. When alive the perianth-organs are spreading and in the center of the flower the characteristic column is erect and very conspicuous. The flowers arise from among large, reticulated bracts. These bracts when dry are rufous and prominently veined.

I have not seen *Ceratostylis retisquama* Reichb. f., which was based on No. 2152 of Cuming's Philippine plants. This species is very inadequately described in "Bonplandia" **5**: 53. The specific name of Reichenbach's plant might easily apply to the species in hand.

LUZON, Province of Rizal, *Bur. Sci. 3042 Ramos*, August 19, 1907: Province of Bataan, Mount Mariveles, *Bur. Sci. 3070 Foxworthy*, "flowers red with white center." MINDANAO, Lake Lanao, Camp Keithley, *Bur. Sci. 3046, 3072 Mrs. Clemens* (specimens flowering in Manila): without locality, *W. S. Lyon 36*.

Ceratostylis latipetala sp. nov.

Aff. *C. rubrae,* speciei quam habitu et structura haec species conspicue simulat. *Planta* robusta. *Caulis* ramosus. *Folia* coriacea, rigida, linearia, 9 ad 15 cm longa, 5 ad 10 mm lata. *Sepala lateralia* ovata vel ovato-oblonga, obtusa, 9-nervia, 1.8 cm longa, 6.5 mm lata, mentum obtusum formantia. *Sepalum dorsale* oblongi-lanceolatum, obtusum, 1.5 cm longum, 6 mm latum. *Petala* cuneato-ovata, ad apicem rotundata, 1.5 ad 1.8 cm longa, 8 ad 9 mm lata. *Labellum* minutum, unguiculatum, subhastatum vel suborbiculare, acuminatum, obtusum, 3-nervium, 2.25 ad 3 mm longum, lamellis 2 intramarginalibus; *unguis* circa 2 mm longus. *Gynostemium* brachiis magnis, rotundatis.

In habit *Ceratostylis latipetala* is almost indistinguishable from *C. rubra.* In its flowers, however, it exhibits unmistakable differences from that species. The labellum alone will serve as a constant differentiating character. This organ is concealed in the sac formed by the coherent lateral sepals. From studies of several flowers the labellum appears to vary to a large extent in the nature of the calli. Sometimes they are very conspicuous, at other times difficult to observe. As in *C. rubra* so in *C. latipetala* the peduncles of the flowers are invested with a series of nervose bracts, the outer one forming a closely appressed sheath which reaches to the base of the perianth. The ovary is always concealed in the bracts. The flowers are described as orange-red. The petals are very characteristic of this species and are the broadest yet recorded for the genus.

MINDANAO, Province of Misamis, Mount Malindang, *For. Bur. 4661 Mearns & Hutchinson,* May, 1906, altitude about 1,400 m.

PHAIUS Lour.

Phaius grandifolius Lour. Fl. Cochinchinensis (1790) 529.

I have seen of this species two specimens which were collected in Mindanao. Along roadsides not far from Malabang, Province of Cotabato, Mindanao, November, 1906, *Mary Strong Clemens 815.*

EULOPHIA R. Br.

Eulophia squalida Lindley Bot. Reg. (1841) Misc. 77.

I refer to this species specimens from Luzon. The plants bear two flower-shoots between which the leaves arise after the flowers are expanded. The sepals are very fleshy, the lateral ones oblong, acute, strongly falcate, about 2 cm long. The petals are oblong-elliptic, obtuse, with raised longitudinal nerves. The labellum is 2 cm long, obscurely 3-lobed, blunt and rounded at the apex, where there are several conspicuously raised nerves. At the base it is contracted into a sulcate claw. The outline of the labellum agrees with the figure of *E. squalida* published by J. J. Smith in the second volume of plates which illustrate "Die Orchideen von Java" (*Plate CLXV*). According to the notes made by Doctor Foxworthy the plants found on Mount Pinatubo grew in very coarse gravelly soil where they received the most intense heat of the sun and where they bloomed in the latter part of the dry season.

LUZON, Province of Benguet, *Bur. Sci. 2818 Mearns,* April, 1907: Province of Zambales, Mount Pinatubo, *Bur. Sci. 2575, 2619, 2613 Foxworthy,* April, 1907, flowers white with purple markings, altitude 700 m. PALAWAN, *Bur. Sci. 898 Foxworthy,* May 22, 1906, edge of forest along trail, flowers white, marked with yellow.

DENDROBIUM Sw.

Dendrobium Lyonii Ames Orchidaceae 2 (1908) 177.

D. acuminatum Kränzl. in Orchis 2: 73, not Rolfe.

Dr. F. Kränzlin in "Orchis" reduces this species. He refers it to the synonymy of *Dendrobium acuminatum* Rolfe. The colored plate which accompanies his article is a fair portrait of *D. Lyonii* and very unlike *Dendrobium acuminatum*. As Dr. Kränzlin has expressed the opinion that *D. Lyonii* is not specifically distinct from *D. acuminatum* and as he has treated it as a variety of this species, supplementary remarks to those I published in "Orchidaceae" seem called for, especially as Dr. Kränzlin has asserted that the illustration of *D. acuminatum* in "Orchidaceae" (*plate 17*) is erroneous and worthless as scientific evidence.

Aside from the structural differences between *D. Lyonii* and *D. acuminatum*, outlined in the original descriptions, there are constitutional differences, if we may rely on the authority of Mr. Lyon, who has collected both species and who has grown them in his garden at Manila. Mr. Lyon assures me that the elevations along the mountains of Bataan where these species grow have been carefully estimated and that *D. acuminatum* is not found below three thousand feet and that it is abundant at an altitude of 3,700 feet. *D. Lyonii*, on the other hand, does not occur above the third Forest Station (2,200 feet) and is found in a narrow zone between 1,700 and 2,000 feet. This difference in distribution is accentuated by the behavior of the plants under culture. At sea level in Manila *D. acuminatum* is tractable and easily brought to flower, while *D. Lyonii* is with difficulty kept alive.

Mr. Lyon who has studied both species in the field and in his gardens of Nagtahan, Manila, writes in a letter dated January 14, 1909: "I notice of course in reading your diagnoses that you lay little if any stress upon vegetative features, but the one I have called your attention to, the presence of an *awn* or short *hard tooth*, at the apex of pseudobulbs of *D. Lyonii*, is a constant feature." "Since the receipt of your letter I have gone over my entire collection, 85 plants of *D. Lyonii* and 34 of *D. acuminatum* and I find that this holds universally good. The apical tooth (rather than awn) is very persistent as well as the old flower-scape. The old flower-scapes decay and fall away from *D. acuminatum* the same season, while those on *D. Lyonii* persist certainly for three or more years."

Mr. Lyon asserts that *D. acuminatum* is practically scentless, while *D. Lyonii*, especially in the morning, and more or less all the time, is strongly and delightfully fragrant.

Dr. Kränzlin's criticism of *plate 17* of "Orchidaceae" is not justified by facts. The plate in question was prepared from a co-type of *D. acuminatum*, as is stated on the second page of Fasc. II. The flowers were drawn with reasonable regard to accuracy and the material which furnished them was carefully preserved for reference. Dr. Kränzlin assumes that the flowers were drawn smaller than they are in nature and that failure to designate the amount of reduction renders the plate worthless as scientific evidence. He bases his remarks on the measurements given in Mr. Rolfe's original description of *D. acuminatum*. In my redescription on page 171 the sepals are given as "up to 3 cm long." In the plate the uppermost flower has lateral sepals that measure 2.7 cm long. In the specimen from which the plate was prepared the lateral sepals are 2.3 to 3 cm in length. Dr. Kränzlin fails to make allowance for foreshortening in the drawing, and, therefore, makes an unjust criticism.

In his description of *D. acuminatum* in "Orchis," Dr. Kränzlin gives the length of the sepals and petals as 3 to 3.5 cm. In the plate which accompanies his description the lateral sepals exceed 4.5 cm in length and in one flower are 5 cm long. Dr. Kränzlin's plate on the other hand portrays *D. Lyonii* which produces larger flowers than *D. acuminatum*.

Notwithstanding Dr. Kränzlin's remarks regarding the color of the flowers of *D. acuminatum* and *D. Lyonii* no change is necessary in the descriptions published in "Orchidaceae." *D. Lyonii* bears purplish flowers according to Mr. Lyon's notes and the type material. *D. acuminatum* has whitish or yellowish sepals and petals and a deeper-colored labellum (brownish when dry).

In Fedde's "Repertorium novarum Specierum regni vegetabilis,"[2] Dr. Kränzlin takes up the name *Sarcopodium* and refers to it in addition to a new species, namely *S. stella silvae, Dendrobium acuminatum* and *D. Lyonii.* This last he now calls *Sarcopodium acuminatum* var. *Lyonii! Sarcopodium stella silvae* was collected in Luzon by A. Loher and is described as a near affinity of *Dendrobium acuminatum.*

Dendrobium Sanderae Rolfe in Gard. Chron. III 45 (1909) 374, *fig. 163;* Orchid Review 17 (1909) 209, *fig. 17.*

I refer to this species two specimens of *Dendrobium* from Luzon. My material agrees with Mr. Rolfe's description and with the illustration which accompanies it. No habitat is given for *Dendrobium Sanderae* either in the "Gardeners' Chronicle" or in the "Orchid Review," so that we may presume that the place of origin of the species is unknown to Mr. Rolfe or else a trade secret. Mr. Rolfe received the type material from Messrs. Sander and Sons of St. Albans, England, who probably introduced it from the East Indies, as it is nearly allied to *Dendrobium Dearei* and *D. parthenium.* The petals of the Philippine material are white, about 4 cm long, and nearly 3 cm wide, rounded at the tip and cuneate at the base. The white sepals are much narrower than the petals and are acute. The middle lobe of the labellum is obcordate or obovate with the margin dentate or crenate. The lateral lobes are much smaller than the middle one and rounded. The throat and lateral lobes are conspicuously striated with purple. In habit *D. Sanderae* resembles *D. Dearei* very closely. The flowers, however, are larger than those of the older species. The striations on the labellum help to distinguish the one from the other. *D. Dearei* has a white and yellow labellum.

LUZON, Province of Benguet, *Bur. Sci. 3497 Mearns,* July, 1907: District of Lepanto-Bontoc, *Bur. Sci. 5614 Dean C. Worcester,* July, 1908, "flowers white, faint odor, throat and tube with purple lines inside:" northern Luzon, *W. S. Lyon 114,* on pine trees, altitude 1,000 to 1,200 m.

ERIA Lindl.

Eria philippinensis Ames Orchidaceae 1 (1905) 94.

To this species I refer, with some hesitation, specimens from Benguet which Curran and Merritt collected in December, 1908. The flowers are much larger than in the type, the labellum measures 9 mm in length. The color of the flowers is a deep-wine-purple. Near the apex of the labellum there is a linear thickening.

LUZON, Province of Benguet, Lusod-Bayabas trail, *For. Bur. 15717 Curran & Merritt,* December 16, 1908, altitude 1500 m, flowers deep-coral-red.

PHREATIA Lindl.

Phreatia bracteata sp. nov.

Pseudobulbi congregati, rotundati, circa 2 cm longi. *Folia* 2, oblongi-lanceolata, acuta, coriacea, 8 ad 10.5 cm longa, circa 1.5 cm lata, ad basim sulcata. *Scapus* usque ad 2.2 dm longus, bracteatus. *Bracteae* scariosae, 9 ad 20 mm longae, acutae. *Racemus* elongatus, usque ad 6 cm longus. *Bracteae inflorescentiae* scariosae, ovato-lanceolatae, acutae, pedicellum cum ovario excedentes, 3 ad 4 mm longae, circa 2 mm latae. *Sepala lateralia* late ovata, obtusa, mentum formantia, 3.5 mm longa, ad basim 2.5 mm lata. *Sepalum dorsale* oblongum, obtusum vel quadratum, 2 mm longum. *Petala* oblonga, obtusa, 2 mm longa, 1.25 mm lata. *Labellum* ovatum, obtusum, 2 mm longum, 1.5 mm latum, ad basim saccatum. *Columna* minuta. *Rostellum* bifidum.

The floral bracts are very conspicuous, slightly rigid and in dried specimens brownish at the center with a wide hyaline margin. The bracts of the scape are tubular, closely appressed and somewhat hyaline when dry. In general habit the plants resemble *Phreatia scaphioglossa* Schlechter.

LUZON, Province of Tayabas, *For. Bur. 7815 Curran & Merritt*, November, 1907: Province of Bataan, Mount Mariveles, *Bur. Sci. 5180 Topping, R. S. Williams 910*, along the Lamao River at an altitude of about 1000 m: Province of Pampanga, Mount Arayat, *Merrill 3916*, October 23, 1904, altitude 820 m, flowers white, odorless.

BULBOPHYLLUM Thou.

Bulbophyllum cuneatum R. A. Rolfe in Ames Orchidaceae 1 (1905) 98.

This, apparently rare species, has been discovered again on Mount Mariveles by D. Le Roy Topping. In his original diagnosis Mr. Rolfe described the scapes as recurved. In my observations I find that this characteristic is always strongly developed and gives the scape below the raceme the appearance of a shepherd's crook. Just at the point of curvature the scape is thickened and below the inflorescence conspicuously dilated. The bracts appear to have been purplish and in the dried specimens examined the petals and lips are deep-purple.

LUZON, Province of Bataan, Mount Mariveles, *Bur. Sci. 5183 Topping.*

Bulbophyllum Dearei Reichb. f. in Flora 71 (1888) 156.

In the herbarium of the Bureau of Science there are seven flowers of this species sent by Mary Strong Clemens from Camp Keithley. When alive they were described by the collector as orange-yellow marked with purple. The plants from which the flowers were taken were found on large *Ficus* and *Vitex* trees. The specimens from Camp Keithley agree very well with specimens of *B. Dearei* preserved in my herbarium. The upper sepal is beautifully veined and cross-veined with brown so that the yellow ground-color is bright and suggests sunlight as seen when filtered through the leaves of trees upon the forest flora. The lateral sepals are conspicuously marked with purple and strongly falcate. The petals are yellow and slightly falcate. *B. bataanense* Ames is a near ally of *B. Dearei*, but is smaller in all its parts and has a narrow upper sepal.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens s. n.*, June, July, 1907.

THELASIS Blume.

Thelasis obtusa Blume Bijdr. (1825) 386.

I refer to this species the material collected by Leiberg on Mount Mariveles, Luzon. This material has monophyllous pseudobulbs which are much shrivelled in the dried state. They appear to have been globular when alive. The general habit of the plants recalls *T. capitata* Bl. but the raceme is elongated, slightly less than 4 cm long, and comparatively lax. The labellum is somewhat saccate and has a minute crest along the median line. Schlechter regards *T. obtusa* as closely related to *T. macrobulbon* Ridl., from which it differs in part through its monophyllous pseudobulbs. *T. macrobulbon* is diphyllous.

In the herbarium of the Bureau of Science there are four flowering scapes of a species of *Thelasis*, presumably from Java, which J. J. Smith has identified as *T. obtusa* Bl. I have compared Leiberg's specimens with these and I find that the floral parts are in almost perfect agreement.

T. obtusa has not been reported, heretofore, as native to the Philippines.

LUZON, Province of Bataan, Mount Mariveles, *J. B. Leiberg 6046*, July 20, 1904, epiphytic, altitude about 900 m.

SACCOLABIUM Blume.

Saccolabium chionanthum Lindl. Journ. Linn. Soc. Bot. 3 (1859) 35.

I follow the authority of J. J. Smith in referring to this species *S. perpusillum* Hook. f. The material from the Philippines which I have studied is in almost perfect agreement with the illustration published in Hooker's "Icones Plantarum" (*pl. 2129*). The flowers are not so pubescent as shown in Hooker's plate, but are papillose. Ridley states that the flowers when alive are hardly pubescent and are rather minutely papillose. His observations in regard to this character convince me that Hooker's illustration may exaggerate it.

The sepals and petals of the Philippine specimens agree perfectly with the figures published by Hooker (although they are very obscurely ciliolate on the margin). The labellum terminates in the same kind of a fleshy apex and at the base produces the same kind of a scrotiform sac as shown by Hooker. The structure of the column in Hooker's plate agrees with my material.

In general habit *Saccolabium chionanthum* suggests *Phreatia parvula*, and unless carefully examined might readily be confused with it when dried.

LUZON, Province of Rizal, *Bur. Sci. 3055 Ramos*, November 14, 1907, flowers small, white.

Java, Sumatra, Singapore.

TRICHOGLOTTIS Blume.

Trichoglottis latisepala sp. nov.

Caulis tenuis, subflaccidus, elongatus, plus minus 3 dm longus, 2.4 mm in diametro. *Vaginae* 1.5 ad 1.7 cm longae. *Folia* lineari-lanceolata, acuta, 7 ad 12 cm longa, 7 ad 10 mm lata, coriacea. *Pedunculi* pauciflori. *Flores* parvuli. *Sepala lateralia* 5 mm longa, subbipartita, vel biloba; lacinia posterior 4 mm longa, obtusa, lacinia anterior similis sed angustior et subbrevior, 2 mm longa. *Sepalum dorsale* oblongum, obtusum, 3-nervium, 6 mm longum. *Petala* oblonga, subspathulata, obtusa, 5 mm longa, 2 mm lata. *Labellum* 3-lobatum, *lobi laterales*

parvi, uncinati, obtusi; *lobus medius* suborbicularis vel ellipticus. *Callus* pilosus prope basim. *Calcar* 3 ad 3.5 mm longum.

Trichoglottis latisepala is very closely allied to *T. lanceolaria* Bl. It is distinguished from that species by its stouter stems, larger leaves and larger flowers. The lateral sepals are shaped like the wing of a bird; the lobes are rounded. The anterior or lower lobe is only slightly shorter than the spur, against which it is closely appressed. The posterior or upper lobe is oblong-lanceolate with a prominent rib along the middle. The pubescent callus at the base of the middle lobe of the labellum is triangular at the free end.

In the Herbarium Hookerianum at Kew there is a specimen from Java, collected by Lobb, which resembles *T. latisepala* and may prove to be conspecific with it. With this specimen there are sketches which show a flower very similar to the flower of *T. latisepala*. The lateral sepals are referred to in a note as being decurrent on the spur. This Javan specimen was originally identified as *T. lanceolaria*. *T. latisepala* may prove to be a variety of *T. lanceolaria* but it does not agree with Javan material in my herbarium identified by J. J. Smith.

MINDANAO, District of Zamboanga, on an island in Cumalarang Bay, *For. Bur. 12345 Hutchinson*, April 19, 1908, in coast forests, flowers light-pinkish-white. NEGROS, *For. Bur. 7241 Everett*, March 19, 1907.

Trichoglottis retusa Blume Bijdr. (1825) 360.

Several specimens collected in different parts of the Philippines appear to belong here. *T. retusa* differs from other Philippine species in its very fleshy oblong leaves which are unequally and conspicuously bilobed or retuse at the tip. The ovate-lanceolate, acuminate, pubescent or densely papillose labellum is also characteristic.

MINDANAO, Province of Surigao, *Bolster 225*, January 17, 1906, flowers yellow, spotted with red. NEGROS, *For. Bur. 5553 Everett*, July-October, 1906. LUZON, Province of Tayabas, *For. Bur. 9653 Curran*, March 22, 1908. BASILAN, *For. Bur. 6103 Hutchinson*.

INDEX TO PHILIPPINE BOTANICAL LITERATURE, V.

By E. D. MERRILL.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

Anonymous. Decades kewensis, XLVII, XLVIII. *Kew Bull.* (1908) 105–116.

Pogostemon nepetoides Stapf is described from material collected in the Philippines by Micholitz.

Ascherson, P. & Graebner, P. Potamogetonaceae. *Pflanzenreich* 31 (1907) 1–184.

In this monograph of the family nine genera are recognized, of which *Potamogeton*, with 87 species and many varieties, is the only one represented in the Philippines. A single species, *P. malainus* Miq., is credited to the Archipelago, but two or three additional ones occur here.

Berkeley, M. J. Enumeration of the Fungi collected by H. Cuming, Esq., F. L. S., in the Philippine Islands. *Hook. Lond. Journ. Bot.* 1 (1842) 142–157, *t. 6, f. 4, 5; t. 7, f. 6–11.*

Thirty-five species are enumerated, of which twenty-two are described as new; *Agaricus philippinensis, Lentinus connatus, Panus badius, Lenzites pallida, L. acuta, Polyporus cumingii, P. grammocephalus, P. philippinensis, P. elongatus, P. intybaceus, Trametes versatilis, T. badia, Daedalea inconcinna, D. tenuis, Stereum perlatum, Corticium hydnatinum, Clavaria surculus, Sphaeria pileiformis, S. examinans, S. micraspis, Tulostoma pusillum*, and *Dichonema erectum.*

Boerlage, J. G. Koordersiodendron celebicum Engl. *Ic. Bogor.* 1 (1901) 55–58, *plates 94, 95.*

The above species is figured and described in detail; it is a synonym of *Koordersiodendron pinnatum* (Blanco) Merr., this monotypic genus extending from Luzon to Celebes and New Guinea.

Copeland, E. B. Some New and Critical Ferns. *Elmer's Leafl. Philip. Bot.* 1 (1908) 233–235. (Article 13.)

Dennstaedtia elmeri Copel., *Cyclophorus acrostichoides* var. *gracilis* Copel., *Elaphoglossum luzonicum* Copel., and *Dryopteris dubia* Copel., are described as new, and notes are given on several other species.

DeCandolle, C. A Revision of the Indo-Malayan Species of Cedrela. *Records Bot. Surv. Ind.* 3 (1908) 357–376.

Nine species are recognized, with many varieties, a single species, *C. febrifuga* Blume, being credited, with doubt, to the Philippines. See Merrill & Rolfe, *This Journal* 3 (1908) *Bot.* 105.

DeCandolle, C. Meliaceae novae. *Ann. Conserv. Jard. Bot. Genève* 10 (1907) 122–176.

Many species are described, including a single one from the Philippines, *Aglaia langlassei* C. DC., which is very closely allied to if not identical with *A. harmsiana* Perk.

Dunn, S. T. A Revision of the Genus Illigera, Blume. *Journ. Linn. Soc. Bot.* 38 (1908) 290–297.

Thirteen species are recognized, of which two are found in the Philippines, *I. ternata* (Blanco) Dunn (=*I. luzonensis* (Presl) Merr.), and *I. platyandra* Dunn, the former confined to the Philippines and Formosa, the latter to southern China, Hongkong, Indo-China, and the Philippines. In regard to the former, *Illigera luzonensis* is the oldest valid name, although the original description and plate are both erroneous in some details. I have examined the type in the Prague Herbarium.

Elmer, A. D. E. Freycinetia from Lucban. *Leafl. Philip. Bot.* 1 (1907) 212–219. (Article 11.)

Eleven species are enumerated from Lucban and Mount Banajao, Province of Tayabas, Luzon, of which eight are described as new: *F. lucbanensis* Elm. (=*F. ferox* Warb. !), *F. confusa* Elm. (=*F. vidalii* Hemsl. !), *F. hemsleyi* Elm. non Warb. (=*F. rigida* Elm.), *F. dilatata* Merr. ex Elm., *F. banahaensis* Elm., *F. palawanensis* Merr. ex Elm., *F. merrillii* Elm., and *F. warburgii* Elm. (See Merrill, Philippine Freycinetia, *This Journal* 3 (1908) *Bot.* 307–315.)

Elmer, A. D. E. Some New Leguminosae. *Leafl. Philip. Bot.* 1 (1907) 221–232. (Article 12.)

A new genus, *Luzonia*, is described, and the following new species: *Luzonia purpurea* Elm., *Cynometra densiflora* Elm. (=*Erythrophloeum !*), *C. alternifolia* Elm. (=*Hardwickia alternifolia* Elm., =*Kingiodendron !*), *Pithecolobium williamsii* Elm. (=*Wallaceodendron celebicum* Koord. !), *Dioclea umbrina* Elm., *Dunbaria merrillii* Elm., *Caesalpinia benguetensis* Elm. =*Mezoneurum benguetense* Elm. (=*C. sepiaria* Roxb.), *Strongylodon zschokkei* Elm., *Derris lianoides* Elm., *Bauhinia whitfordii* Elm., and *Mucuna curranii* Elm.

Elmer, A. D. E. A Fascicle of Tayabas Figs. *Leafl. Philip. Bot.* 1 (1907) 236–261. (Article 14.)

Forty-one species are enumerated from the region about Lucban, Province of Tayabas, Luzon, of which the following are described as new: *Ficus inequifolia* Elm., *F. warburgii* Elm., *F. banahaensis* Elm., *F. lucbanensis* Elm., *F. tayabensis* Elm., and *F. linearifolia* Elm. Several other species are credited to the Philippines for the first time.

Elmer, A. D. E. A century of New Plants. *Leafl. Philip. Bot.* 1 (1908) 272–359. (Article 16.)

One hundred species are described as new, a large number of which are manifestly identical with previously described ones. *Pollia philippinensis* is probably the same as *P. thyrsiflora* (Blume) Steud., *Persea sterculioides* is *Phoebe*, *Scutinanthe engleri* ascribed to *Burseraceae*, is *Heynia sumatrana* Miq. (*Meliaceae*), *Dichapetalum spicatum*, ascribed to *Dichapetalaceae*, is *Osmelia conferta* (Turcz.) Benth. (*Flacourtiaceae*), *Glochidion leytense* is an extreme form of *G. album* (Blanco) Boerl., *G. sablanense* is not specifically distinct from *G. benguetense*, *Pimeleodendron dispersum* is *Actephila*, *Croton curtiflorus*, ascribed to the *Euphorbiaceae*, is *Sycopsis philippinensis* Hemsl. (*Hamamelidaceae*), *Antidesma membranaefolium* is *A. cumingii* Muell. Arg., *Ilex rolfei* is apparently the same as *I. formosana* Max., *Grewia banahaensis*, ascribed to *Tiliaceae*, is *Leptonychia* ! (*Sterculiaceae*), *Pterocymbium gigantifolium* is *Sterculia jagori* Warb., *Eurya myrtilloides*, ascribed to *Theaceae*, is *Ilex luzonica* Rolfe ! (*Aquifoliaceae*), *Homalium sorsogonense* is *H. villarianum* Vid., *Eugenia succulenta* is *E. robertii* Merr., *Rivea glabrata* is *R. luzonensis* Hallier f. !, *Schefflera piperoidea* is *S. trifoliata* Merr. & Rolfe !, *Stachys rubisepala* is *Calamintha umbrosa* (Bieb.) Benth. !, *Gomphostemma*

luzonense is *Paraphlomis rugosa* (Benth.) Prain (*Phlomis rugosa* Benth.), *Uncaria clavisepala* is *U. velutina* Havil., *Wendlandia membranifolia* is *W. luzoniensis* DC., and probably the same as *W. paniculata* DC., and *Blumea copelandii* is *Conyza japonica* Less.

This is the last article of the first volume of the "Leaflets", and is followed by four pages of errata and an index, bringing the volume up to 374 pages. In the errata the following new names appear: *Vernonia benguetensis* (*V. vialis* Elm. p. 94, non DC.), *Emilia marivelensis* (*E. humifusa* Elm. p. 148, non DC.), *Freycinetia rigida* (*F. hemsleyi* Elm. p. 214, non Warb.), *Hardwickia alternifolia* Elm. (*Cynometra alternifolia* Elm. p. 223), and *Mezoneurum benguetense* (*Caesalpinia benguetensis* Elm. p. 226).

In volume 2, the sequence of both articles and pages is continued from volume 1.

Gehrmann, K. Vorarbeiten zu einer Monographie der Gattung Bridelia mit besonderer Berücksichtgung der africanischen Arten. *Engl. Bot. Jahrb.* 41 (1908) Beil. 95: 1–42.

Forty-three species are recognized, of which two, *Bridelia stipularis* Blume, and *B. tomentosa* Blume, are credited to the Philippines.

Hamet, R. Monographie du Genre Kalanchoe. Bull. Herb. Boiss. II 7 (1907) 870–900; 8 (1908) 17–48.

Sixty-one species are recognized, a single one, *Kalanchoe pinnata* Pers., credited to the Philippines.

Hennings, P. Fungi philippinenses I. *Hedwigia* 47 (1908) 250–265.

One hundred and thirteen species are enumerated, of which sixty-one species, and one genus, *Merrilliopeltis*, are described as new. The same paper is also printed in *This Journal* 3 (1908) *Bot.* 41–58., but the one in "Hedwigia" has priority.

Hemsley, W. B. Sycopsis philippinensis Hemsl. *Hook. Ic. Pl.* IV 9 (1907) sub *pl. 2836.*

The above species is described, but not figured, the first representative of the family (*Hamamelidaceae*), to be found in the Philippines. The same species has been later described by Mr. Elmer as *Croton curtiflorus*, Leafl. Philip. Bot. 1 (1908) 310.

Hemsley, W. B. Sciaphila clemensae Hemsl. *Hook. Ic. Pl.* IV 9 (1907) *pl. 2850, f. 7–14.*

The above species is described and figured from material collected by Mrs. Clemens in Mindanao; the second species of the genus for the Philippines.

Hemsley, W. B. Aleurites trisperma Blanco. *Kew Bull.* (1908) 105, 106.

Mature fruits and seeds of the above species are figured and described, and the relationships of the species with *Aleurites fordii* Hemsl., discussed.

Hochreutiner, B. P. G. Revision du Genre Hibiscus. *Ann. Conserv. Jard. Bot. Genève* 4 (1900) 23–169.

One hundred and ninety-seven species are recognized in the genus of which but few are definitely credited to the Philippines: of the species considered, the following are now known from the Archipelago; *Hibiscus lampas* Cav., *H. campylosiphon* Turcz., *H. tiliaceus* Linn., *H. syriacus* Linn. (cult.), *H. surattensis* Linn., *H. cannabinus* Linn. (cult.), *H. sabdariffa* Linn. (cult.), *H. rosa-sinensis* Linn. (cult.), *H. mutabilis* Linn. (cult.), *H. esculentus* Linn. (cult.), *H. abelmoschus* Linn., *H. hænkeanus* (Presl) Hochr., and *H. manihot* Linn. var. *pungens* (Roxb.) Hochr. Several additional species have since been described from the Archipelago.

Jack, J. B. & Stephani, F. Hepaticae Wallisianae. *Hedwigia* **31** (1891) 11–27.

Twenty-one Philippine species are enumerated, collected in Luzon by Wallis. Three species are described as new, *Herbertia longispina* Jack & Steph., *Thysanolejeunea gottschei* Jack & Steph., and *Schistochila wallisii* Gott. & Jack.

Kränzlin, F. Neue und kritischen Arten. *Orchis* **2** (1907) 16.

Microstylis philippinensis is described as new.

Macfarlane, J. M. Nepenthaceae. *Pflanzenreich* **36** (1908) 1–92.

The family consists of a single genus, *Nepenthes*, of which 58 species and many varieties are recognized. The following are credited to the Philippines: *Nepenthes blancoi* Blume, *N. philippinensis* Macfar., *N. copelandii* Merr., *N. ventricosa* Blanco, *N. burkei* Mast., and the varieties *excellens* Veitch and *prolifica* Mast., *N. phyllamphora* Willd., *N. alata* Blanco, and the varieties *ecristata* Macfar., and *biflora* Macfar., and *N. deaneana* Macfar. The above species, with the exception of *N. phyllamphora* Willd., are endemic in the Philippines.

Mildbraed, J. Stylidiaceae. *Pflanzenreich* **35** (1908) 1–98.

Six genera are recognized, the species being mostly confined to the southern hemisphere, the greatest number in Australia. *Stylidium*, the largest genus, has 103 species, all Australian except a few that extend to Malaya and India. No species is recorded from the Philippines, but the Australian *Stylidium alsinoides* R. Br., has been collected several times in Luzon.

Murrill, W. A. Some Philippine Polyporaceae. *Bull. Torr. Bot. Club.* **34** (1907) 465–481.

Sixty-nine species are enumerated from the Philippines, the following being described as new: *Coriolus cuneatiformis, Funalia philippinensis, Hapalopilus subrubidus, Inonotus elmerianus, Microporellus subdealbatus, Polyporus coracinus, P. palensis, Spongipellis luzonensis, Trametes caespitosa, T. lamaensis, T. luzonensis, T. subacuta, T. williamsii, Tyromyces elmeri, Amauroderma elmerianum, Elfvingia elmeri, Fomes luzonensis, F. philippinensis, Ganoderma subtornatum, G. williamsianum, Pyropolyporus lamaensis, P. merrillii, P. williamsii,* and *Gloeophyllum edule.* There are also many new combinations.

Murrill, W. A. A collection of Philippine Polypores. *Elmer's Leafl. Philip. Bot.* **1** (1908) 252–271. (Article 15.)

Thirty-six species are enumerated, the paper being compiled from one by the same author published previously in the *Bull. Torr. Bot. Club.* **34** (1907) 465–481, noted above.

Murrill, W. A. Additional Philippine Polyporaceae. *Bull. Torr. Bot. Club* **35** (1908) 391–416.

One hundred and two species are enumerated, based on material supplied by the Bureau of Science. One new genus, *Whitfordia,* based on *Fomes warburgiana* P. Henn., and the following 38 new species are described: *Coltricia benguetensis, Coriolopsis copelandi, C. bataanensis, C. melleoflava, C. subcrocata, C. clemensiae, Coriolus currani, C. perpusillus, C. rubritinctus, C. subvernicipes, Cycloporellus barbatus, Favolus resinosus, F. subrigidus, Hapalopilus ramosii, Hexagona luzonensis, H. pertenuis, Inonotus clemensiae, Trametes conglobata, T. insularis, Tyromyces merrittii, T. subchioneus, T. unguliformis, Amauroderma asperulatum, A. bataanense, A. clemensiae, A. ramosii, Fomes subresinosus, F. subungulatus, Ganoderma balabacense, G. currani, Pyropolyporus subextensus, P. tenuissimus, P. tricolor, Daedalea isabellina, D. subconfragosa, Gloeophyllum nigrozonatum, Lenzites clemensiae,* and *L. submurina.*

Oliver, D. Strychnos ignatii Bergius. *Hook. Icon.* IV **3** (1892) *pl. 2212.*

What is supposed to be the above species is figured and described, and the complicated synonymy of the species is discussed.

Oliver, D. Strychnos multiflora Benth. *Hook. Icon.* IV **3** (1892) *pl. 2213.*

The above Philippine species is figured and described.

Pampanini, R. & Bargagli-Petrucci, G. Monografia della famiglia delle Stackhousiaceae. *Bull. Herb. Boiss.* II **5** (1905) 901–916; 1046–1060; 1145–1160: **6** (1906) 39–44.

Two genera are recognized, *Stackhousia* Sm., and *Macgregoria* F. Muell., the latter monotypic and confined to Australia, the former with 20 species and many varieties, confined to Australia, Tasmania, and New Zealand, with a single variety in the Philippines. The specimen collected in Luzon by Cuming (no. 976), referred by Bentham to *S. muricata* Lindl., is made the type of *S. intermedia* Bailey var. *philippinensis* Pamp. The introduction and systematic part of the paper is by Pampanini, and the anatomical part is by Bargagli-Petrucci.

Pfitzer, E. & Kränzlin, F. Orchidaceae-Monandrae-Coelogyninae. *Pflanzenreich* **32** (1907) 1–169.

Fifteen genera are recognized, the following species credited to the Philippines: *Coelogyne bilamellata* Lindl., *C. sparsa* Reichb. f., *C. chloroptera* Reichb. f., *C. marmorata* Reichb. f., all endemic, the last imperfectly known; *Dendrochilum arachnitum* Reichb. f., *D. convallariiforme* Schauer, *D. filiforme* Lindl., *D. cucullatum* (Ames) Pfitz., *D. longilabre* (Ames) Pfitz., *D. graciliscapum* (Ames) Pfitz., *D. magnum* Reichb. f., *D. cobbianum* Reichb. f., *D. latifolium* Lindl., *D. cucumerinum* Reichb. f. (?), *D. uncatum* Reichb. f. and var. *lancifolia* Reichb. f., *D. cinnabarinum* Pfitz., *D. glumaceum* Lindl., and var. *valida* Rolfe, *D. longifolium* Reichb. f., *D. sphacelatum* (Ames) Pfitz., *D. tenellum* (Ames) Pfitz., *D. williamsii* (Ames) Pfitz., *D. graminifolium* (Ames) Pfitz., *D. tenellifolium* (Ames) Pfitz., *D. tenue* (Ames) Pfitz., *D. parvulum* (Ames) Pfitz., *D. venustulum* (Ames) Pfitz., *D. strictiforme* (Ames) Pfitz., *D. oliganthum* (Ames) Pfitz., *D. ocellatum* (Ames) Pfitz., *D. recurvum* (Ames) Pfitz., *D. philippinense* (Ames) Pfitz., *D. turpe* (Ames) Pfitz., *D. anfractum* (Ames) Pfitz., *D. merrillii* (Ames) Pfitz., *D.? pumilum* Reichb. f., *D. whitfordii* (Rolfe) Pfitz. & Kränzl., all endemic except *D. longifolium; Pholidota triotos* (Reichb. f.) Pfitz., *P. conchoidea* Lindl., and *P. imbricata* Lindl., the first two endemic, the last widely distributed. *Dendrochilum* especially should be studied with reference to Ames Orchidaceae **2** (1908) 76–121, where descriptions of and key to 43 Philippine species are given, including many new species not considered in the above monograph.

Prain, D. Patchouli. *Kew Bull.* (1908) 78–82.

The patchouli plant of commerce is shown to be *Pogostemon cablin* (Blanco) Benth., first described from Philippine material.

Prantl, K. Das System der Farne. *Arb. Kgl. Bot. Garten Breslau* 1 (1892) 1–38.

In a consideration of the genus *Microlepia*, the following species are credited to the Philippines: *M. trichosticha* J. Sm., *M. pilosula* (Wall.) Presl, and *M. speluncae* (L.) Moore.

Radlkofer, L. Sapindaceae Philippinenses novae. *Elmer's Leafl. Philip. Bot.* **1** (1907) 208–211. (Article 10.)

Four species are described as new, *Allophylus unifoliatus* Radlk., *Aphania angustifolia* Radlk., *Dictyoneura sphaerocarpa* Radlk., and *Mischocarpus ellipticus* Radlk.

Robinson, C. B. Alabastra philippinensia, I. *Bull. Torr. Bot. Club.* 35 (1908) 63–75.

In this paper the following new species are described: *Pandanus glauciphyllus, Thalictrum philippinense, Anaxagorea radiata, Cyathocalyx acuminatus, Mitrephora williamsii, Uvaria rubra, Uvaria scandens, Sabia philippinensis, Elaeocarpus venosus, Daphne luzonica, Sarcopyramis delicata,* and *Clethra williamsii. Thesium santaloides* Hance, and *Pisonia longirostris* T. & B., are credited to the Philippines for the first time, while critical notes are given on several other species. The paper is based on material collected in the Philippines by R. S. Williams.

Rolfe, R. A. The Localities of Cuming's Philippine Plants. *Kew Bull.* (1908) 116–119.

Considerable previously unpublished information regarding Cuming's explorations in the Philippines is given, taken largely from his correspondence with Sir William Hooker.

Rolfe, R. A. New Orchids, Decade 32. *Kew Bull.* (1908) 412–416.

Coelogyne loheri Rolfe is described from material collected in Luzon.

Schlechter, R. Monographie der Podochilinae. *Mém. Herb. Boiss.* 21 (1900) 1–78.

Four genera are recognized, of which the largest is *Podochilus* with 47 species, the following being credited to the Philippines: *P. serpyllifolius* Lindl. and *P. zollingeri* Reichb. f., Java and the Philippines, *P. cornutus* (Bl.) Schltr., Indo-Malaya to southern China and the Philippines, *P. micranthus* (Lindl.) Schltr., endemic, *P. undulatus* (Bl.) Schltr., Malay Archipelago and the Philippines, *P. xytriophorus* (Reichb. f.) Schltr., Malay Peninsula to Borneo and the Philippines, *P. pendulus* (Bl.) Schltr., Malay Peninsula and Archipelago to New Guinea and the Philippines, and *P. philippinensis* Schltr., endemic. *Thelasis* with 6 species has one representative in the Philippines, *T. elongata* Bl., extending to Hongkong, the Malay Peninsula and Archipelago.

Seemen, O. von. Eine neue Quercus-Art von den Philippinen. *Fedde's Repertorium* 5 (1908) 21.

Quercus merrillii Seem., is described from material collected in Palawan.

Servettaz, C. Note préliminaire sur la Systématique des Elaeagnacées. *Bull. Herb. Boiss.* II 8 (1908) 381–394.

Thirty-eight species of *Elaeagnus* are recognized, the only genus of the family extending to the Philippines, represented here by *E. cumingii* Schlecht., a species which has been reduced by most recent authors to *E. latifolia* Linn.

Sonnerat, P. Voyage à la Nouvelle Guinée. i-xvi, 1–202, *pl. 1–120.* Paris, 1776.

Pages 19–147 and plates 12–94 refer to the Philippines, and there are occasional Philippine notes elsewhere, so that these Islands, in spite of the title, form the main subject-matter of the book, which is of greater ornithological than botanical importance.

Sonnerat left France in 1769, and Port Louis in Mauritius on June 29, 1771, and visiting several smaller islands en route reached Cavite on September 3. He sailed again on December 29, having spent the intervening time in Manila, Cavite, and especially in what he considered an adventurous trip to the country near Laguna de Bay. The week from January 7 to 14 was passed at Antique in Panay, whence he sailed to Zamboanga, arriving January 18. From here one of the two ships made a side trip to Jolo. The reunited expedition sailed from Zamboanga on February 9, and made

no further stops in the Philippines, visited the Moluccas and other islands as far as New Guinea, and was again in Mauritius by June 4.

With the doubtful exception of *Menichea rozata*, no specific names were originated in this work, but several plants were figured and described, a majority of them Philippine. Those figured from this Archipelago are "le roucou" *pl. 13, Bixa orellana* L.; "la sapotte negro" *pl. 14–16, Diospyros ebenaster* Retz.; "la bergkias," *pl. 17, 18,* which he believed to be only an introduced plant in the Philippines, a species of *Gardenia,* referred by De-Candolle to *G. thunbergiana* L. f., somewhat resembling *G. longiflora* Vidal, but not agreeing exactly with any recent collections; "la pandacaqui," *pl. 19, Tabernaemontana pandacaqui* Poir., subsequently described from Sonnerat's collections, and erroneously localized as from New Guinea; "le rima ou fruit à pain," *pl. 57–60, Artocarpus rima* Blanco, usually reduced to *A communis* Forst.; "le cacao," *pl. 61, 62, Theobroma cacao* L.; "le petit citron doux," *pl. 63, Triphasia trifoliata* (L.) DC.; "la houette," *pl. 90, 91, Ceiba pentandra* (L.) Gaertn., here said to be native; "la menichea rozata." *pl. 92, 93,* on which *Butonica rosata* Miers was in part based, *Barringtonia racemosa* (L.) Roxb.; "la manssanas," *pl. 94, Zizyphus jujuba* L. Two other Philippine plants are figured from collections made before his arrival in the Islands, "la pagatpate," *pl. 10, 11, Sonneratia caseolaris* (L.) Engl., and "le bonet quarré ou la Commerçona," *pl. 8, 9, Barringtonia asiatica* (L.) Kurz. Reference is made on page 196 to the introduction into Mauritius in 1768 by Prevost of the nutmeg, afterwards described from Sonnerat's collections as *Myristica philippensis* Lam., Mauritius afterwards serving as a centre of distribution for this species into other tropical countries.

Many of his collections subsequently formed a part of Commerson's herbarium, and have occasionally been credited to the latter, who never visited the Philippines, being prevented by unfavorable conditions on the occasion of his chief attempt. (C. B. Robinson.)

Sonnerat, P. Voyages aux Indes orientales et à la Chine, fait par ordre du Roi, depuis 1774 jusqu'en 1781. i–xvi, 1–318, i–viii, 1–298, *pl. 1–140.* Paris, 1782.

This work is more or less supplementary to the preceding and only pages 104–119 of the second volume relate to the Philippines. No further description is given of species from the Archipelago, but there are interesting notes on the cultivation of many important plant products. He appears to have made but the one visit. (C. B. Robinson.)

Turczaninow, N. Description des Elaeocarpées des collections asiatiques de MM. Cuming et Zollinger. *Bull. Soc. Nat. Mosc.* **19** [2] (1846) 489–496.

The following species are described from the Philippines: *Elaeocarpus nitidus* Turcz., non Jack, which Turczaninow himself later [1] reduced to *E. oblongus* Gaertn., *Mocanera isotricha* (=*Elaeocarpus isotrichus* (Turcz.) F.-Vill.), and *M. multiflora* (=*E. multiflorus* (Turcz.) F.-Vill.).

Turczaninow, N. Decas secunda generum adhuc non descriptorum adjectis descriptionibus nunnullarum specierum Byttneriacearum. *Bull. Soc. Nat. Mosc.* **19**[2] (1846) 497–510.

Four genera and five species are described as new, based on Cuming's Philippine plants; *Hexagonotheca cordata* (=*Berrya ammonila* Roxb.), *Antherotriche lanceolata* (=*Anisoptera thurifera* Blanco), *Pterocalymna paniculata* (=*Lagerstroemia paniculata* (Turcz.) Vid.), *Gonostegia oppositifolia* and *G. alternifolia* (both =*Memoralis pentandra* (Roxb.) Wedd.).

[1] *L. c.* **31** [1] (1858) 235.

Turczaninow, N. Decas tertia generum adhuc non descriptorum adjectis descriptionibus nonnullarum specierum Myrtacearum Xerocarpicarum atque Umbelliferarum imperfectarum. *Bull. Soc. Nat. Mosc.* 20[1] (1847) 148–174.

A single Philippine plant is considered, *Anisostemon trifoliatus*, described as a new genus and species (=*Connarus trifoliatus* (Turcz.) Rolfe).

Turczaninow, N. Asclepiadeae aliquae indescriptae. *Bull. Soc. Nat. Mosc.* 21[1] (1848) 250–262.

One genus and species in two other genera are described as new, based on Cuming's Philippine plants; *Triplolepis cumingii* (=*Streptocaulon cumingii* (Turcz.) F.-Vill.), *Streptocaulon obtusum* (=*S. baumii* Decne.), and *Secamone macrostachya* (=*Tylophora perrottetiana* Decne.).

Turczaninow, N. Decas quarta et quinta generum adhuc non descriptorum. *Bull. Soc. Nat. Mosc.* 21[1] (1848) 570–591.

Four genera and six species are described as new, based on Cuming's Philippine plants; *Lachnopetalum glabrum* (=*Lepidopetalum perrottetii* Blume), *Otolepis nigrescens* (=*Otophora fruticosa* Blume), *Zygolepis rufescens* (=*Arytera rufescens* (Turcz.) Radlk.), *Meladenia densiflora* (=*Psoralea badocana* (Blanco) Benth.), *Schleichera subundulata* (=*Mischocarpus sundaicus* Blume), and *S. revoluta* (=*Mischocarpus fuscescens* Blume).

Turczaninow, N. Synanthereae quaedam hucusque indescriptae. *Bull. Soc. Nat. Mosc.* 24[1] (1851) 166–214.

The following Philippine species are considered: *Conyza tetraptera* n. sp. (=*Laggera alata* Less.), *C. oligandra* n. sp. (=*C. viscidula* Wall.), *Minyranthes heterophylla* n. gen. & n. sp. (=*Siegesbeckia orientalis* L.), *Bidens tridentata* n. sp., and *B. denudata* n. sp. (both=*Glossogyne tenuifolia* Cass.), *Spilanthes grandiflora* n. sp., *Gynura affinis* n. sp. and *G. glabra* n. sp. (both=*G. sarmentosa* DC.).

Turczaninow, N. Asclepiadeae quaedam indescriptae fasciculus 2. *Bull. Soc. Nat. Mosc.* 25[2] (1852) 310–325.

A single Philippine species is considered, *Amblyoglossum brevipes* as a new genus and species (=*Tylophora brevipes* (Turcz.) F.-Vill.).

Turczaninow, N. Animadversiones ad primam partem herbarii Turczaninowianii nunc Universitatis Caesareae Charkowiensis. *Bull. Soc. Nat. Mosc.* 27[2] (1854) 271bis–372.

The following plants are credited to, or described from the Philippines: *Stephania corymbosa* Blume, to which 1160 Cuming is referred, the specimen being *S. exigua* Miers, *Cissampelos cumingiana* n. sp. (=*C. pareira* L.), *Capparis lasiopoda* n. sp., *C. luzonensis* n. sp., *C. lobbiana* n. sp., the latter credited to Singapore, but the specimen was from the Philippines, *Roydsia philippinensis* n. sp., (=*Stixis philippinensis* (Turcz.) Merr.), *Hisingera? grandifolia* n. sp., which has been reduced to *Flacourtia rukam* Z. & M., *Salomonia ramosissima* n. sp. (=*S. oblongifolia* DC.), *Securidaca corymbosa* n. sp., *Pittosporum brachysepalum* n. sp. (=*P. pentandrum* (Blanco) Merr.), *Bergia glandulosa* n. sp. (=*B. serrata* Blanco), and *Pentaloba fasciculata* n. sp. (=*Alsodeia fasciculata* (Turcz.) F. Vill.=*Rinorea*). Three species of *Phoberos* are mentioned without specific name, all referable to *Scolopia*.

Turczaninow, N. Animadversiones in secundam partem herbarii Turczaninowianii, nunc universitatis Caesareae Charkowiensis. *Bull. Soc. Nat. Mosc.* 31[1] (1858) 185–250; 379–476.

In this paper about sixty Philippine species are considered, including four genera and thirty-seven species which are described as new, as follows: *Pavonia rubiformis* n. sp. (=*Urena lobata* L.), *Hibiscus campylosiphon* n. sp. (=*Bombycidendron campylosiphon* (Turcz.) Warb.), *Malachra lineariloba*

n. sp. (=*M. fasciata* Jacq., var. *lineariloba* (Turcz.) Gürke), *Grewia petitiana* A. Rich.?, *G. cumingiana* n. sp., *G. eriopoda* n. sp., *Columbia celebica* Blume?, *C. inaequilatera* n. sp. (=*C. serratifolia* (Cav.) DC.), *Sczegleewia involucrata* n. gen. & n. sp. (=*Symphorema luzonicum* (Blanco) F.-Vill.), *Diplodiscus paniculatus* n. gen. & n. sp., which has been reduced by Pierre to *Brownlowia*, but which is apparently a valid genus, *Hopea squamata* n. sp. (=*Shorea squamata* (Turcz.) Dyer), *Saurauia rugosa* n. sp. (=*S. elegans* (Choisy) F.-Vill.), *Sclerostylis nitida* n. sp. (=*Atalantia disticha* (Blanco) Merr.), *Micromelum tephrocarpum* n. sp., *M. molle* n. sp., the latter and possibly the former the same as *M. pubescens* Blume, *Ancistrolobus floribundus* n. sp. (=*Cratoxylon floribundum* (Turcz.) F.-Vill.), *A. micradenius* n. sp. (=*C. blancoi* Blume), *Schmidelia grossedentata* n. sp. (=*Allophylus grossedentatus* (Turcz.) Radlk.), *Sapindus forsythii* DC.?, the specimen being referable to *S. saponaria* Linn. var., *Sapindus cinereus* n. sp. (=*Euphoria cinerea* (Turcz.) Radlk.), *S. stellulatus* n. sp. (=*E. stellulata* (Turcz.) Radlk.), possibly not distinct from the preceding, *S.? cultratus* n. sp. (=*Trigonachras cultrata* (Turcz.) Radlk.), *Cupania lessertiana* Cambess. (the specimen is *Mischocarpus sundaicus* Bl.), *Dodonaea viscosa* L., *Otolepis nigrescens* Turcz. (=*Otophora fruticosa* Blume), *Aglaia cumingiana* n. sp., *A. macrobotrys* n. sp., *A. denticulata* n. sp., *A. hexandra* n. sp., *Schizochiton tetrapetalus* n. sp. (=*Chisocheton*), *Hartighsea cauliflora* n. sp. (=*Dysoxylum cumingianum* C. DC.), *H. schizochitoides* n. sp. (=*Dysoxylum schizochitoide* (Turcz.) C. DC.), *Sandoricum indicum* L., *Dasycoleum philippinum* n. sp. (=*Chisochiton philippinum* (Turcz.) Harms), *Cissus flexuosa* n. sp. (=*Stemonurus laxiflorus* (Miers) Merr.), *Vitis cumingiana* n. sp. a doubtful species, *Oxalis cumingiana* n. sp. (=*Biophytum sensitivum* (L.) DC.), *Toddalia effusa* n. sp. and *T.? ambigua* n. sp., (both=*T. asiatica* (L.) Kurz), *Euonymus timorensis* Zipp.?, (the specimen is *E. philippinensis* Merr.), *Celastrus polybotrys* n. sp. (=*C. paniculatus* Roxb.), *Casearia cinerea* n. sp., *C. leucolepis* n. sp. (the latter based on a specimen collected by Lobb, and credited to Singapore, but Lobb's specimen in the Kew herbarium is labelled Luzon), *Stachycrater philippinus* n. gen. & n. sp. (=*Osmelia philippina* (Turcz.) Benth.), *Buchanania longifolia* Span.? (the specimen is *B. arborescens* Blume), *Garuga mollis* n. sp. (=*Garuga abilo* (Blanco) Merr.), and *Marignia? nitida* n. sp. (=*Glycosmis cochinchinensis* (Lour.) Pierre).

Turczaninow, N. Animadversiones ad Catalogum primum et secundum herbarii Universitatis Charkoviensis. *Bull. Soc. Nat. Mosc.* **36**[1] (1863) 545–615.

The following Philippine species are considered: *Lachnopetalum glabrum* Turcz. is transferred to *Ratonia*, as *R. lachnopetalum*, and *Zygolepis rufescens* to the same genus as *R. zygolepis* (see above 684), *Zanthoxylum? triplinerve* n. sp., a doubtful species, *Chailletia benthamiana* n. sp. (=*Dichapetalum benthamianum* (Turcz.) Engl.), *Ryssopteris ovata* n. sp. (=*Anisopteris ovata* (Turcz.) Merr. & Rolfe), and *Helicteres hirsuta* Blume, var.?

Turczaninow, N. Verbenaceae et Myporaceae nonnullae hucusque indescriptae. *Bull. Soc. Nat. Mosc.* **36**[2] (1863) 193–227.

Sczegleewia luconensis n. gen. & sp. (non *Sczegleewia* Turcz. supra) (=*Pterospermum obliquum* Blanco), and *Premna philippinensis* n. sp. (=*Vitex turczaninowii* Merr.), are described from the Philippines.

Turczaninow, N. Quelques observations sur les espèces du genre Clethra. *Bull. Soc. Nat. Mosc.* **36**[2] (1863) 228–235.

Clethra lancifolia Turcz. is described from the Philippines, based on *Cuming 855*, and *Lobb 499*, the latter credited to Singapore, but collected in Luzon.

PHILIPPINE BORAGINACEÆ.

By C. B. Robinson.

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

This family has an unusually small number of species endemic in the Philippines, only 3 of the 21 here reported being as yet unknown outside the Archipelago, and one of these is very closely related to a species of very wide distribution. No novelties are recorded, but an attempt has been made to settle the synonymy, so far as its Philippine complications are concerned: nearly all the systematic problems, however, involve plants of other countries. It is improbable that the present figures will be materially altered by future exploration. Both tropical and temperate elements are included, the former represented by the species of such genera as *Cordia* and *Ehretia,* the latter by *Cynoglossum, Bothriospermum,* and *Trigonotis,* in which the Philippines mark the extreme southeastern limit, at least for the species represented. The appended table enumerates the species of all the genera of the family which have been found in Malaysia.

Genus.	India.[1]	Malay Peninsula.[2]	Malay Archipelago[3]	China.[4]	Formosa.[5]	Philippine Islands.
Bothriospermum	1			4	1	1
Coldenia	1	1	1	1	1	1
Cordia	15	3	16	2	1	3
Cynoglossum	10		1	5	2	2
Ehretia	10	2	7	7	7	4
Heliotropium	16	2	9	2	2	3
Lithospermum (*Havilandia*)	3		2	5		
Rotula (*Rhabdia*)	1		1			1
Tournefortia	12	1	6	4	2	3
Trichodesma	5				1	2
Trigonotis	5			4		1
Zoelleria			1			
Other genera	61			17		
Total	140	9	44	51	17	21

[1] Clarke in Hook. f. Fl. Br. Ind. 4 (1883) 134–179.

[2] King & Gamble in Journ. As. Soc. Bengal 74[2] (1905) 277–284.

[3] Boerl. Handl. Kenn. Fl. Ned. Ind. 2[2] (1899) 486–488.

[4] Forbes & Hemsl. in Journ. Linn. Soc. Bot. 26 (1890) 143–155; 36 (1905) 451–530.

[5] Matsum. & Hayata in Journ. Coll. Sci. Tokyo 22 (1906) 253–259.

KEY TO THE PHILIPPINE GENERA OF BORAGINACEAE.[6]

Styles terminal.
  Trees or shrubs, sometimes climbing.
    Style single.
      Style twice forked ..... 1. *Cordia*
      Style distinctly 2-lobed ..... 2. *Ehretia*
      Style simple or indistinctly 2-lobed.
        Leaves less than 2 cm long ..... 4. *Rotula*
        Leaves at least 5 cm long ..... 5. *Tournefortia*
    Styles 2 ..... 2. *Ehretia*
  Herbaceous.
    Fruit entire ..... 3. *Coldenia*
    Fruit splitting naturally into 2 or 4 ..... 6. *Heliotropium*
Styles not terminal; never trees or shrubs.
  Fruiting calyx enlarged, inclosing nutlets ..... 7. *Trichodesma*
  Fruiting calyx not enlarged, usually spreading.
    Nutlets armed with barbed prickles ..... 8. *Cynoglossum*
    Nutlets tuberculate-roughened ..... 9. *Bothriospermum*
    Nutlets very smooth ..... 10. *Trigonotis*

1. CORDIA Linn.

Calyx not or very obscurely ribbed.
  Calyx and tube of corolla about same length ..... 1. *C. blancoi*
  Corolla-tube over twice as long as calyx ..... 2. *C. subcordata*
Calyx strongly 10-ribbed ..... 3. *C. cumingiana*

1. **Cordia blancoi** Vidal Rev. Pl. Vasc. Filip. (1886) 192.

C. sebestena Blanco Fl. Filip. (1837) 121; Naves in Blanco Fl. Filip. ed. 3 (1877) *pl. 43;* non Linn. Sp. Pl. (1753) 190.

C. dichotoma Blanco Fl. Filip. (1837) 123; forsan Forst. Prodr. (1786) 18.

C. myxa Llanos Mem. Real Acad. Ci. Madrid 4 (1859) 508; Benth. Fl. Austr. 4 (1869) 386, quoad philippinensis; Vidal Sinops. Atlas (1883) xxxiv, *pl. 70, D;* F.-Vill. Noviss. App. (1880) 137; forsan Linn. Sp. Pl. (1753) 190.

C. speciosa ? Naves l. c.; non Salisb. Prodr. (1796) 111.

C. leschenaultii Vidal Revis. Pl. Vasc. Filip. (1886) 193; non DC. Prodr. 9 (1845) 482.

C. paniculata F.-Vill. Noviss. App. (1880) 138; forsan Roth Nov. Pl. Sp. (1821) 125.

LUZON, Province of Ilocos Sur, Santiago, *For. Bur. 14069 Merritt & Darling:* Province of Benguet, Sugpan, *For. Bur. 14131 Merritt & Darling:* Province of Isabela, Ilagan, *Bur. Sci. 8134 Ramos:* Province of Nueva Ecija, Bongabong, *For. Bur. 9595 Zschokke:* Province of Rizal, Bosoboso, *Merrill 1827, 2625;* Taytay, *Bur. Sci. 2687 Ramos:* Province of Zambales, Botolan, *Merrill 1912:* Province of Bataan, Mariveles, *Ahern 783;* Lamao River, *Whitford 1262, For. Bur. 768, 1267, 1273 Borden, Merr. Dec. Philip. For. Fl. 191 Borden:* Province of Cavite, Magallanes, *For. Bur. 7695 Merritt & Curran:* Province of Laguna, Los Baños, *Elmer s. n.:* Province of Tayabas, Malicboi, *Ritchie 22m;* Mulanay, *For. Bur. 10305 Curran;* Tayabas, *For. Bur. 7100 Kobbe:* Province of Camarines, Tinambac, *For. Bur. 14257 Aguilar;* Pasacao, *Ahern 33, 791:* Province of Sorsogon, between Sorsogon and Gubat, *For. Bur. 10546 Curran.* MINDORO, Mangarin,

[6] This key is only partially natural, as it is intended for local use, and some of our species do not show clearly the characters of their genera.

For. Bur. 9793 Merritt; Maugao, *For. Bur. 9849, 9856 Merritt;* Bulalacao, *For. Bur. 9862 Merritt.* GUIMARAS, Nagaba, *For. Bur. 321 Gammill.* MASBATE, Uson, *For. Bur. 1008 Clark.* BURIAS, *For. Bur. 983 Clark.* LEYTE, Palo, *Elmer 7373;* Ormoc, *For. Bur. 11574 Whitford.* MINDANAO, Province of Surigao, *Ahern 355:* Province of Misamis, *Cuming 1612:* District of Davao, Davao, *Copeland 342;* Darong, *Williams 2697;* Santa Cruz, *Williams 2713, 2714:* Lake Lanao, Camp Keithley, *Mrs. Clemens 605, 645, 1070, s. n.:* District of Cotabato, Malabang, *Mrs. Clemens s. n.:* District of Zamboanga, San Ramon, *Hallier s. n.;* Port Banga, *For. Bur. 9256, 9366 Whitford & Hutchinson.* BASILAN, *Hallier s. n.* PALAWAN, Iwahig, *Bur. Sci. 833 Foxworthy;* Irahuan, *For. Bur. 4502 Curran.*

This species is undoubtedly very closely allied to *C. myxa* Linn., and in spite of a total lack of material for comparison, would here have been reduced to it, had it not been for Clarke's positive statement[7] "leaves . . . . . never acuminate." Throughout the long series of plants above quoted, there are only three or four mature leaves in all which are not acuminate, the acumen is occasionally acute, but much more often obtuse, its width nearly constant. Even the great majority of very young leaves distinctly show an acumen. Bentham, who includes the Philippine plants, not then described as separate, with *C. myxa,* says, *l. c.,* that the leaves are "very obtuse or shortly acuminate," but I do not know how far Philippine material may have been responsible for the exception. Gürke[8] figures them as shortly and sharply acuminate. The size of the flowers of *C. blancoi* more often exceeds the limits stated by Clarke for *C. myxa,* the calyx before anthesis often having a length of 5.5 or even 6 mm.

A specimen with the under surface of the (young) leaves and the inflorescence much more pubescent than any of the collections above cited, but otherwise agreeing with the species, is *For. Bur. 4455 Ahern's collector,* Antipolo, Prov. Rizal, Luzon, the type of *C. blancoi mollis* Merr. Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 61.

Local names, *anonang, anunang, anunong,* or *anonung,* throughout the Archipelago, recorded as one or other of these variants from Ilocos, Benguet, Nueva Ecija, Rizal, Bataan, Cavite, Tayabas, Camarines, and Sorsogon provinces in Luzon, also from Mindoro, Guimaras, Masbate, Leyte, Surigao, Davao, Zamboanga, and Palawan.

Celebes: range of *C. myxa,* Egypt to tropical Australia.

2. **Cordia subcordata** Lam. Ill. **1** (179?) 421.

C. banalo Blanco Fl. Filip. (1837) 124.

C. ignota Blanco l. c. ed. 2 (1845) 88.

LUZON, Province of Batangas, Malabuyo, *For. Bur. 7742 Curran & Merritt:* Province of Tayabas, Pitogo, *For. Bur. 10233 Curran:* Province of Camarines, Pasacao, *Ahern 84, For. Bur. 10478 Curran.* BURIAS, *For. Bur. 1733 Clark.* MINDORO, Baco, *For. Bur. 5507 Merritt.* MINDANAO, District of Davao, Malalag, *Copeland 620;* Santa Cruz, *DeVore & Hoover 230, Williams 2734.* BASILAN, *For. Bur. 6120 Hutchinson, Hallier s. n.* PALAWAN, Agoho Point, *For. Bur. 3780 Curran;* near Puerto Princesa, *For. Bur. 3528 Curran.*

Local names, *balug,* Basilan; *agotot,* Burias; *sigan dagat,* Camarines.

East Africa, Madagascar, southern Asia, and Malaya to Australia and Hawaii.

3. **Cordia cumingiana** Vidal Phan. Cuming. Philip. (1885) 187.

C. propinqua Merr. Bur. Govt. Lab. Publ. (Philip.) **35** (1906) 60.

LUZON, Province of Union, Bauang, *Elmer 5663:* Province of Pangasinan,

[7] Fl. Br. Ind. 4 (1883) 136.

[8] Pflanzenfam. 4[3a]: 82, *f. 33, M-P.*

Cuming 1012: Province of Rizal, Antipolo, *Merrill 1321;* Bosoboso, *For. Bur. 2969 Ahern's collector;* Montalban, *Merrill 5069, For. Bur. 2454 Ahern's collector.* MINDORO, *Baco, Merrill 1181.* LEYTE, Palo, *Elmer 7101.* MINDANAO, District of Davao, Davao, *Copeland s. n.*

This species is mentioned by Gürke in the Pflanzenfamilien as belonging to the section *Myxa;* it has, however, the calyx strongly 10-ribbed, quite as it is in American species belonging to the sections *Gerascanthus* and *Pilicordia*, and as the corolla does not persist beyond flowering time, it is to be included in the latter. All species recorded as belonging to either of the two last sections are tropical American, all those of *Pilicordia* being Brazilian, and this is apparently a case of remarkable geographical distribution.

The types of *C. cumingiana* and *C. propinqua* are not identical, but subsequent collections have united the two series. The Mindanao and Leyte specimens have leaves with acute bases, and thicker styles, one of the Montalban numbers has the acute bases but the slender styles found in all the rest.

Local name, *Anonang lalaqui,* Mindoro.

Endemic.

SPECIES EXCLUSA.

CORDIA OLITORIA Blanco Fl. Filip. (1837) 123.

Certainly to be excluded from the family; reduced by F.-Villar to *Pisonia inermis* Forst. (*Nyctaginiaceae*).

2. EHRETIA Linn.

Styles single, bifid.

Leaves serrate ..... 1. *E. acuminata*

Leaves entire.

Calyx increasing in fruit, fruit 4–6 mm diameter, corolla-tube 4 to 6 mm long ..... 2. *E. navesii*

Calyx not increasing in fruit, fruit smaller, corolla-tube shorter. 3. *E. philippinensis*

Styles two, undivided, more rarely single and deeply parted..... 4. *E. microphylla*

1. **Ehretia acuminata** R. Br. Prodr. (1810) 497.

E. polyantha DC. Prodr. 9 (1845) 503.

E. virgata Blanco Fl. Filip. (1837) 127, non Sw. Prodr. (1788) 47.

E. onava DC. l. c. 511.

LUZON, Province of Cagayan, San Vicente, *For. Bur. 11298 Klemme:* Province of Nueva Ecija, near San Jose, *For. Bur. 8479 Curran:* Province of Zambales, between Castillejos and Aglao, *For. Bur. 5848 Curran:* Cabuuan, *For. Bur. 6938 Curran:* Province of Rizal, San Mateo, *For. Bur. 1131 Ahern's collector;* Bosoboso, *Merrill 1846, 1857;* Caytilabag, *Bur. Sci. 21 Foxworthy;* Antipolo, *Merrill 1679, For. Bur. 458 Ahern's collector.*

Although both Naves and F.-Villar agreed in interpreting Blanco's species quite differently, there can be no doubt that it and therefore *E. onava*, which was based on it, should be reduced to *E. polyantha.* The latter is clearly synonymous with *E. acuminata*, although, in that species, the corolla-tube is said to be very short, and its lobes 3 mm long, in Philippine material the tube is nearly 1 mm, and the lobes rarely 2.5 mm, the leaves also varying from elliptic-oblong, as described for *E. acuminata,* almost to orbicular.

Local names, *opa,* Cagayan; *balagla,* Nueva Ecija; *calibinung, baliwit,* Zambales; *tanaua, panau, malaanonag, canawa,* Rizal. The names from near Manila suggest Blanco's *onava.*

Himalayas to Japan and Australia.

2. **Ehretia navesii** Vidal Revis. Pl. Vasc. Filip. (1886) 194.

E. virgata Naves in Blanco Fl. Filip. ed. 3 (1877?) *pl. 70*, nec Blanco nec Sw.

E. setosa Naves l. c., non Roxb. Fl. Ind. 2 (1824) 342.

Menais mollis Blanco Fl. Filip. (1837) 139.

E. mollis Merr. Bur. Govt. Lab. Publ. (Philip.) 6 (1904) 5; non Wall. ex DC. Prodr. 9 (1845) 511.

Menais blanda Blanco ex DC. l. c. 512, quasi synon.

E. onava F.-Vill. Noviss. App. (1880) 138, non DC. l. c.

LUZON, Province of Cagayan, Solana, *Bur. Sci. 7884 Ramos:* Province of Isabela, Cabagan Nuevo, *Bur. Sci. 8087 Ramos:* Province of Ilocos Norte, *Cuming 1184;* Nagpartian, *For. Bur. 13842 Merritt & Darling;* Bangui, *For. Bur. 13898 Merritt & Darling:* Province of Ilocos Sur, *Cuming 1130:* District of Lepanto, Cervantes, *Bur. Sci. 7022 Ramos:* Province of Nueva Vizcaya, Paloc River, *For. Bur. 18015 Merritt, For. Bur. 10864 Curran;* Dupax, *For. Bur. 14855 Darling:* Province of Benguet, Baguio, *Elmer 8480;* Twin Peaks, *Elmer 6333:* Province of Nueva Ecija, *For. Bur. 8422 Curran;* Carranglang, *Merrill 390:* Province of Pangasinan, Villasis, *Alberto 37;* Rosales, *Alberto 65, 71:* Province of Rizal, Bosoboso, *Bur. Sci. 122 Foxworthy;* Antipolo, *For. Bur. 7031 Curran;* Mount Santander, *Bur. Sci. 3259 Ramos;* Malapadnabato, *Merrill 2724;* Manila, *Merrill s. n.:* Province of Laguna, Los Baños, *Elmer s. n.:* Province of Tayabas, Pagsalan, *For. Bur. 10363 Curran.* MINDANAO, Province of Surigao, Surigao, *Bolster 236.*

Typical specimens of this species are easily distinguished from typical ones of *E. philippinensis*, but there are often puzzling intermediates. To the characters given in the key, it may be added that the leaves of *E. navesii* are usually broader, more rounded at the base, and have more numerous veins than those of the other species, but none of these can be depended upon. Even as regards the more natural characters given in the key, it must be confessed that specimens here referred to one or the other species approach the limits of size given very closely; further, several collections, all referred here to *E. navesii*, seem to have the calyx already longer at anthesis: these grade into the others so gradually that they have not been separated. I have not followed Clarke in his reduction of *E. philippinensis* to *E. laevis* var. *timoriensis*, because the only description I have found of flowers of the latter states that the corolla-tube is shorter than the calyx; in *E. philippinensis*, they are regularly longer, though sometimes but little, being about the size ascribed by Clarke to typical *E. laevis*. Indian and Ceylon material of that species in this herbarium, though undoubtedly very closely allied, seems sufficiently distinct. If Formosan material in this herbarium named as *E. formosana* Hemsley has been correctly identified, that species must be reduced to *E. navesii*. Otherwise, it is apparently confined to the Philippines.

Local names, *maragooed*, Ilocos Norte; *talibunog*, Lepanto; *malatadiang*, Nueva Vizcaya; *malabayabas*, Nueva Ecija (surely an error); *sangubat*, Rizal; *calambunog*, Pangasinan; *alimbungug*, Surigao.

3. **Ehretia philippinensis** DC. Prodr. 9 (1845) 504.

E. beurreria Blanco Fl. Filip. (1837) 127; non *E. bourreria* Linn. Sp. Pl. ed. 2 (1762) 275.

E. blancoi DC. l. c. 511.

E. laevis timoriensis Clarke in Hook. f. Fl. Br. Ind. 4 (1883) 142, quoad philippinensis.

BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 4110 Fénix.* LUZON, Province of Ilocos Sur, *For. Bur. 14143 Merritt & Darling:* District of Bontoc, Bontoc,

For. Bur. 10979 Curran: Province of Benguet, Mount Pulog, *For. Bur. 18198 Curran Merritt & Zschokke;* Sugpan, *For. Bur. 14105 Merritt & Darling;* Baguio, *For. Bur. 15843 Curran & Merritt;* Twin Peaks, *For. Bur. 10803 Curran:* Province of Zambales, Candelaria, *Bur. Sci. 4712 Ramos;* Tapulao, *Bur. Sci. 5102 Ramos:* Province of Bataan, Mount Mariveles, Lamao River, *Williams 368, 513, Elmer 6830, For. Bur. 2103 Borden:* Province of Rizal, Bosoboso, *For. Bur. 1993 Ahern's collector, Merr. Dec. Philip. For. Fl. 245 Ahern's collector:* Province of Camarines, Pasacao, *Ahern 122, 152.* CEBU, Dalindangan River, *For. Bur. 6449 Everett.* NEGROS, *For. Bur. 5594 Everett.* GUIMARAS, *For. Bur. 285 Gammill.* PALAWAN, Tanabag River, *For. Bur. 7419 Manalo.* MINDANAO, District of Davao, Santa Cruz, *Williams 2756:* Lake Lanao, Camp Keithley, *Mrs. Clemens 306, 511, s. n.:* District of Zamboanga, Tetuan, *Ahern 576.* BASILAN, *Hallier s. n.*

Local names, *aurnaug,* Ilocos Sur; *ludungla,* Bontoc; *anonang,* Benguet; *malapaco,* Zambales; *palimumog, talibobong,* Rizal; *anonangin, macaisa,* Camarines; *alibungog,* Cebu; *clamungog,* Guimaras.

Endemic: *E. laevis* ranges from India to Australia.

4. **Ehretia microphylla** Lam. Ill. 1 (179?) 425.

E. buxifolia Roxb. Pl. Corom. 1 (1795) 42, *pl. 57.*

Carmona heterophylla Cav. Ic. 5 (1799) 23, *pl. 438.*

Carmonea heterophylla Blanco Fl. Filip. (1837) 209.

Ehretia heterophylla Spreng. Syst. 1 (1825) 648; Naves in Blanco Fl. Filip. ed. 3 (1877 ?) *pl. 72.*

Cordia retusa Vahl Symb. 2 (1791) 42; non *Ehretia retusa* Wall. ex DC. Prodr. 9 (1845) 511.

BATANES ISLANDS, Batan Island, Santo Domingo de Basco, *Bur. Sci. 3623 Fénix.* BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 4017 Fénix.* LUZON, Province of Ilocos Norte, Bangui, *For. Bur. 14692 Darling:* Province of Cagayan, *Bur. Sci. 7903 Ramos, For. Bur. 16620 Curran, For. Bur. 16463, 16690 Bacani:* Province of Nueva Vizcaya, Dupax, *Bur. Sci. 8248 Ramos;* Santa Cruz, *For. Bur. 15785 Curran & Merritt:* Province of Benguet, Sablan, *Elmer 6167;* Twin Peaks, *Elmer 6347:* Province of Union, Bauang, *Fénix 7:* Province of Bataan, Lamao River, *Merrill 2538, Elmer 6850, Williams 186, For. Bur. 1603 Borden:* Province of Rizal, Manila, *Merrill 3476, Marave 46;* Malapadnabato, *Merrill 2726:* Province of Laguna, Los Baños, *Elmer s. n.:* Province of Tayabas, Pagsalan, *For. Bur. 11112, 11121 Curran:* Province of Camarines, Pasacao, *Ahern 810.* MASBATE, *Merrill 3057.* TICAO, *For. Bur. 1014 Clark.* BOHOL, Guindulman, *Bur. Sci. 1238 McGregor.* MINDANAO, District of Davao, Davao, *Copeland 884;* Santa Cruz, *Williams 2763:* District of Cotabato, Malabang, *Mrs. Clemens 787:* District of Zamboanga, Tetuan, *Ahern 554, 621.* BASILAN, *DeVore & Hoover 13.*

Local names, *palupo,* Batan; *itsa,* Ilocos; *cha,* Bataan; *chaa bundoc,* Manila; *cham bundoc,* Malapadnabato; *putputay,* Pasacao; *marumara,* Masbate; *maramara,* Ticao; *buyobuyo, buyocbuyoc,* Zamboanga, Basilan; *ycha nga atap,* Union.

It is still uncertain which is the oldest available name for this species; the oldest, that of Vahl, is not available. The first part of volume 1 of Lamarck's Illustrations was published in 1791, the first part of volume 2 in 1797. *Ehretia microphylla* was published in the second or remaining part of volume 1, one of the few parts of the entire work for which the dates have not been accurately ascertained. This name has been generally adopted of late on the supposition that it dated from 1791, the presumption is still in its favor.

India, Malaya, Formosa.

3. COLDENIA Linn.

Coldenia procumbens Linn. Sp. Pl. (1753) 125.

LUZON, Province of Cagayan, Solana, *Bur. Sci. 7892 Ramos:* Province of Union, San Fernando, *Herb. San Fern. High School:* Province of Pangasinan, *Cuming 995;* Baui, *Bur. Sci. 4920 Ramos:* Province of Pampanga, Arayat, *Merrill 1464:* Province of Rizal, Bosoboso, *Bur. Sci. 6787 Robinson;* Taytay, *Bur. Sci. 2655 Ramos;* Tanay, *Bur. Sci. 3343 Ramos.* MINDORO, Magaran, *Bur. Sci. 6637 Robinson.*

Local name, *papa atinuang,* Union.

Cosmopolitan in the tropics of both hemispheres.

4. ROTULA Lour.

Rotula aquatica Lour. Fl. Cochinch. (1790) 121.

Rhabdia lycioides Mart. Nov. Gen. & Sp. 2 (1827) 136, *pl. 195.*

LUZON, Province of Cagayan, Tuguegarao, *Bolster 198, Bur. Sci. 7874 Ramos:* Province of Ilocos Norte, *Bur. Sci. 2225 Mearns:* Province of Zambales, Candelaria, *Bur. Sci. 4809 Ramos:* Province of Bulacan, near Norzagaray, *Yoder 171:* Province of Rizal, Montalban, *For. Bur. 3400 Ahern's collector.* MINDORO, Tubile, *For. Bur. 8646, 9929 Merritt.*

Used as a house decoration at Tuguegarao, where it is very common. Plant usually scandent, growing on rocks in river-beds, or in sandy soil near streams.

The identity of *Rotula aquatica* and *Rhabdia lycioides* was stated by Clarke,[9] but without comment. Loureiro's names are the older, both for the species and genus, the genus is considered to be monotypic, and the name *Rotala* in the *Lythraceae,* the only obstacle, is sufficiently distinct. If *Rhabdia* were retained, a new combination would be necessary. In order to finally settle the question, information was sought from Dr. A. B. Rendle, of the British Museum of Natural History, where Loureiro's collections are preserved. He writes: "Loureiro's type of *Rotula aquatica* consists mostly of leafless twigs but there are fragments of flowers fruits and leaves which put beyond doubt the identity of the plant with *Rhabdia lycioides.* An anatomical examination of the twigs confirms the identity. As you suggest in your letter the name *Rotula* must be taken for the genus."

Tropics of both hemispheres.

5. TOURNEFORTIA Linn.

Coastal trees or shrubs; corolla-tube about same length as calyx.... 1. *T. argentea*
Shrubby, usually scandent; corolla-tube much longer than calyx.
  Calyx densely tomentose ..... 2. *T. horsfieldii*
  Calyx, though pubescent, not tomentose..... 3. *T. sarmentosa*

1. **Tournefortia argentea** Linn. f. Suppl. (1781) 133.

T. arborea Blanco Fl. Filip. (1837) 129.

BATANES ISLANDS, Sabtan Island, Santo Domingo de Basco, *Bur. Sci. 3762 Fénix.* BABUYANES ISLANDS, Fuga Island, *Bur. Sci. 3252, 3253 Mearns;* Babuyan Island, *Bur. Sci. 3894 Fénix:* Camiguin Island, *Bur. Sci. 3894, 4004 Fénix.* LUZON, Province of Cagayan, Palaui Island, *For. Bur. 16934 Curran:* Province of Pangasinan, northwest coast, *Bur. Sci. 8351 Curran & Merritt:* Province of Camarines, Pasacao, *Ahern 221, 244.* MINDORO, Pinamalayan, *For. Bur. 6733 Merritt;*

[9] Hook. f. Fl. Br. Ind. 4 (1883) 145.

Tubile, *For. Bur. 8554 Merritt.* Apo Island, Mindoro Straits, *Merrill 414, Bur. Sci. 179 Bermejo.* Balabac, *Bur. Sci. 382 Mangubat.* Sulu, Jolo, *Williams 3124.* Leyte, Panaon Island, *Lyon 13.*

Local names, *vangta*, Sabtan; *bantal*, Palaui; *baracbarac*, Apo Island.

Ceylon to Australia and Mauritius.

2. **Tournefortia horsfieldii** Miq. Fl. Ind. Bat. 2 (1857) 927.

Luzon, Province of Ilocos Norte, *Cuming 1215, Bur. Sci. 2318 Mearns;* Bangui, *For. Bur. 14694 Darling;* Badoc, *For. Bur. 13954 Merritt & Darling:* Province of Benguet, Baguio, *Elmer 8467, Topping 143;* Mount Pulog, *For. Bur. 16103 Curran Merritt & Zschokke:* Province of Zambales, Mount Tapulao, *Bur. Sci. 4799 Ramos;* Rio Baquiling, *For. Bur. 6980 Curran?* Province of Pangasinan, Villasis, *Alberto 86:* Province of Pampanga, Arayat, *Merrill 1385.*

Very doubtfully distinct from *F. sarmentosa.* Duplicates of the two Cuming collections upon which these species were credited to the Philippines are in this herbarium, and have been very carefully examined. The most obvious difference is in the extent of the pubescence, not only upon the calyx, but also the corolla, rachis, and the under surface of the leaves. There is a further difference in the shape of the calyx-lobes, those of *T. sarmentosa* being shorter and broader and more obtuse, those of *T. horsfieldii* being longer (2.5 mm), narrowly lanceolate, and subacute. An attempt to separate the later collections on this basis, has led to the conclusion that its apparent naturalness is illusory. Miquel places these species in different sections, the fruits of *T. sarmentosa* being capable of division into two, those of *T. horsfieldii* into four parts. Fruits were examined from all our Philippine collections having them, 20 in all, and all gave practically the same result, that they more easily divided into two, but each of these again divided nearly as easily into two. When the attempt is made by inserting a needle at the base, the first split is a quadrant in about one-fourth of the cases. Otherwise, the numbers above cited well agree with Miquel's description. The corolla-tube, both in our specimens referred to this and to the following species is longer than described for either, in a large majority of the cases being from 7 to 12 mm. But it is often possible on the same branches to find others, apparently mature but much shorter, so that while this may possibly be a natural character, it is incapable of application. With this goes a difference in the length of the corolla-lobes, both lobes and tube appearing to elongate after the flowers have opened.

Local name, *pangas*, Pampanga.

Malaya.

3. **Tournefortia sarmentosa** Lam. Ill. 1 (179?) 416.

T. urvilleana Cham. in Linnaea 4 (1829) 465.

T. hirsutissima Blanco Fl. Filip. (1837) 128; non Linn. Sp. Pl. (1753) 140.

Babuyanes Islands, Camiguin Island, *Bur. Sci. 3949 Fénix.* Luzon, Province of Cagayan, *Bur. Sci. 7906 Ramos, For. Bur. 16499 Bacani, For. Bur. 16739 Curran, For. Bur. 18616 Klemme:* Province of Benguet, *Bur. Sci. 5305 Ramos:* Province of Union, Bauang, *Elmer 5652:* Province of Bataan, Dinalupijan, *Merrill 1575;* Lamao River, *Whitford 15, Merrill 2525, Williams 525, For. Bur. 2844 Meyer:* Province of Rizal, Bosoboso, *Merrill Dec. Philip. For. Fl. 260 Ahern's collector;* Jala-Jala, *Chamisso* (carbon-print of type of *T. urvilleana* in herb. Berol.): Province of Laguna, Los Baños, *Hallier s. n., Elmer s. n.;* Calauan, *Cuming 468:* Province of Tayabas, Atimonan, *Whitford 696:* Province of Camarines, *Ahern 256.* Polillo, Burdeos, *Bur. Sci. 9212 Robinson.* Masbate, *Merrill 3040, For. Bur. 1692 Clark.* Romblon, *Copeland s. n.* Lubang, *Merrill 971.* Palawan, Puerto Princesa, *For. Bur. 3549 Curran, Bur. Sci. 339 Bermejo;*

Iwahig, *Bur. Sci. 805 Foxworthy, Merrill 784.* UBIAN, *Merrill 5397.* MINDANAO, District of Davao, Santa Cruz, *Williams 2705:* District of Zamboanga, San Ramon, *Hallier s. n.* BASILAN, *Hallier s. n.*

Mauritius to Malaya and Australia.

6. HELIOTROPIUM Tourn.

Coarse weed, with leaves at least 5 cm long ..... 1. *H. indicum*
Much smaller, leaves not over 1.5 cm long.
  Fruit distinctly 4-lobed ..... 2. *H. bracteatum*
  Fruit not or indistinctly 4-lobed ..... 3. *H. strigosum*

1. **Heliotropium indicum** Linn. Sp. Pl. (1753) 130.

Heliophytum indicum DC. Prodr. 9 (1845) 556.

Tiaridium indicum Lehm. Asperif. 1 (1818) 14.

Heliotropium parviflorum Blanco Fl. Filip. (1837) 80, non Linn. Mant. 2 (1771) 201.

So common throughout the Archipelago that it is now rarely collected, represented in this herbarium by the following.

BABUYANES ISLANDS, Camiguin Island, *Bur. Sci. 3970 Fénix.* BATANES ISLANDS, Batan Island, *Bur. Sci. 3700 Fénix.* LUZON, Province of Ilocos Norte, *Bur. Sci. 2241 Mearns:* Province of Zambales, *Merrill 2092, Bur. Sci. 5071 Ramos:* Province of Pampanga, *Parker:* Province of Bataan, *Williams 48, For. Bur. 1954 Borden:* Province of Rizal, *Elmer 5534, Philip. Normal School 182 Abceda, Merrill 28:* Province of Laguna, *Cuming 723, Marave 43:* Province of Cavite, *Bur. Sci. 176 Foxworthy:* Province of Tayabas, *For. Bur. 6609 Kobbe.* MARINDUQUE, *collector unknown.* PANAY, *Merrill 2409.* MINDANAO, Province of Surigao, *Allen 154:* District of Davao, *DeVore & Hoover 208:* Lake Lanao, *Mrs. Clemens.* BASILAN, *DeVore & Hoover 81, 83.*

Local names, *malacudcuran,* Zambales; *camantigui,* Manila; *hinlalayon,* Bulacan; *bunut leon,* Tayabas: *trompa elefante,* Manila; Marinduque, Panay, Basilan; *apostes,* Basilan. The names given by Blanco under *H. parviflorum* are *hinlalayon* and *cotingcotingan.*

Tropics of both hemispheres.

2. **Heliotropium bracteatum** R. Br. Prodr. (1810) 493.

MINDANAO, District of Davao, Davao, *Copeland 538.*

Southern India to Australia.

3. **Heliotropium strigosum** Willd. Sp. Pl. 1 (1797) 743.

LUZON, Province of Zambales, Iba, *Merrill 328,* with very narrow leaves, falling under the variety *brevifolium.*

Western Asia to Australia.

HELIOTROPIUM CURASSAVICUM Linn. Sp. Pl. (1753) 130.

This species is reported by Fernandez-Villar as growing near the shore at Manila. It is not represented by recent collections, but is not unlikely to have been introduced.

HELIOTROPIUM COROMANDELIANUM Naves in Fl. Filip. ed. 3. (1877) *pl. 28;* F.-Vill. in Noviss. App. (1883) 138; non Retz. Obs. 2 (1781) 9.

? Schleidenia parciflora Llanos in Mem. Real Acad. Ci. Madrid 4 (1859) 499; non DC. Prodr. 9 (1845) 557.

This species, now regarded as a synonym of *H. ovalifolium* Forsk., is not represented by Naves' plate, and nothing corresponding to either has appeared in recent collections: the plate was presumably drawn from Philippine material, but is too imperfect to permit exact identification. The known Philippine plants

which superficially most resemble it belong to other families, but it may prove to be a true *Heliotropium*. Llanos' species, from Angeles, Pampanga, where it is known as *taling-bondoc*, has no other means of identification: it was reduced to *H. coromandelianum* by Villar, and if really known to him, may prove the key to the situation. As yet, this local name does not appear in this herbarium on any sheet of *Boraginaceae* or any species of other families suggested by Naves' plate.

7. TRICHODESMA R. Br.

Calyx-lobes in fruit cordate or hastate..... 1. *T. indicum*
Calyx-lobes not cordate nor hastate..... 2. *T. zeylanicum*

1. **Trichodesma indicum** R. Br. Prodr. (1810) 496.

Borago indica Linn. Sp. Pl. (1753) 137; Blanco Fl. Filip. ed. 2 (1845) 60, non Blanco Fl. Filip. (1837) 81.

LUZON, Province of Rizal, Tanay, *Bur. Sci. 3335 Ramos;* Manila, *Merrill s. n.:* Province of Laguna, Santa Rosa, *Bur. Sci. 6093 Robinson.*

Persia, India, Mauritius.

2. **Trichodesma zeylanicum** R. Br. Prodr. (1810) 496.

Borago zeylanica Burm. f. Fl. Ind. (1768) 41.

Borago indica Blanco Fl. Filip. (1837) 81.

B. africana ? Blanco Fl. Filip. ed. 2 (1845) 60.

LUZON, Province of Cagayan, Tuguegarao, *Bur. Sci. 7950 Ramos:* Province of Ilocos Norte, *Bur. Sci. 2204, 2303 Mearns;* Banna, *Bur. Sci. 7694 Ramos:* Province of Pampanga, Arayat, *Merrill 1466:* Province of Rizal, Bosoboso, *Merrill 2623:* Province of Tayabas, *Cuming 680:* locality unknown, *Marave 160.*

India, Australia, Mascarene Islands. There seems to be much doubt regarding the occurrence of this genus elsewhere in Malaya, in spite of its wide distribution: Miquel enumerates both of the present species, but apparently had not seen either; Boerlage omits the genus altogether. In the Philippines, it is almost certainly introduced, although long established.

8. CYNOGLOSSUM Tourn.

Nutlets margined, stem-pubescence appressed..... 1. *C. furcatum*
Nutlets not margined, stem-pubescence spreading..... 2. *C. micranthum*

1. **Cynoglossum furcatum** Wall. in Roxb. Fl. Ind. 2 (1824) 6.

LUZON, Province of Benguet, Bued River, *Merrill 4299;* Baguio, *Elmer 6381, Williams 1129;* Rio Trinidad, *Bur. Sci. 5543 Ramos:* District of Bontoc, *For. Bur. 14457 Darling, For. Bur. 16533 Curran & Merritt.* MINDANAO, District of Davao, Mount Apo, *Copeland 1134.*

Afghanistan to Ceylon and Japan.

2. **Cynoglossum micranthum** Desf. Cat. Hort. Paris. (1804) 220.

LUZON, Province of Cagayan, *Cuming 1341:* Province of Nueva Vizcaya, Mount Umuguen, *Bur. Sci. 8265 Ramos:* Province of Benguet, Pauai, *Bur. Sci. 4445 Mearns;* Sayat to Balangaban, *For. Bur. 15949 Bacani;* Rio Trinidad, *Bur. Sci. 5543a Ramos;* Mount Pulog, *For. Bur. 16103 Curran Merritt & Zschokke;* Mount Tonglon (Santo Tomas), *Merrill 4833, For. Bur. 4956 Curran, Bur. Sci. 5474 Ramos.*

While these are the species so-called in eastern Asiatic botany, they do not exactly agree with the descriptions in the *Flora of British India.* Our *C. micranthum* differs in having slightly larger calyx-lobes, and nearly all the flowers are pedicelled except when very young; the fruit in our specimens is about 4 mm in diameter: Philippine *C. furcatum* has more pubescent leaves than described,

though the Apo specimen which is in flower seems to be cospecific and is less pubescent than the plants from northern Luzon; the stems have the appressed pubescence directed downward except toward the apex; the fruit is about 6 mm in diameter.

China, Malaya, India, eastern Africa.

9. **BOTHRIOSPERMUM** Bunge.

Bothriospermum tenellum Fisch. & Mey. Ind. Sem. (1835) 24.

Anchusa tenella Hornem. Hort. Hafn. 1 (1812–1815) 176.

LUZON, Province of Benguet, Baguio, *Elmer 5774, Williams 1359.*

There is difficulty over the specific name, involving species in two genera. Hornem. Enum. Pl. Hort. Bot. Hafn. (1807) 3, enumerated *Anchusa tenella* Herb. Vahl, with no additional data, so that the name is a mere nomen nudum. The plant was *Cynoglossum denticulatum* DC. Prodr. 10 (1846) 150, with no other earlier synonyms.

In 1813, Hort. Reg. Bot. Hafn. 1: 176, Hornemann definitely published *Anchusa tenella*, the basis of the present species, and added as a note: "In Herb. Vahlii asservatur sub nomine Anch. zeylanica planta huic similis, sed cum inflorescentia (Racemus) differt, hanc novam esse speciem opinatus sum."

Jacquin, Ecl. 1 (1811–1816) 47, *pl. 29*, has the following: "29. Anchusa zeylanica. Anchusa zeylanica, herbacea caule prostrato, foliis ovatis, hirsutis; floribus solitariis interfoliaceis pedunculatis. Anchusa zeylanica. Herb. Vahlii. Hornemann, Enumer. plant. horti botanici hafniensis. 1807." This is followed by a description of a plant, presumably that from which his diagnosis was drawn, which has been found by DeCandolle and others to be the same as *Bothriospermum tenellum*.

The difficulties thus are two, the first a question of fact, whether Hornemann's or Jacquin's name is the older, the other a matter of interpretation, as to which of the two species is to be considered the type of *Anchusa zeylanica* Jacq.

Bibliographic research can alone decide the former, but the probabilities, based upon the number of pages in his volume, give the preference to Jacquin. It seems clear, moreover, that he took the name from Hornemann, believing that he had the same species as the plant of the Vahl herbarium: had Hornemann actually published *A. zeylanica*, there would be no other option than to identify Jacquin's species with *Cynoglossum denticulatum*, making necessary a change in its specific name. But since *A. zeylanica* Vahl ex Hornem. is a nomen nudum, it is apparently better to retain the name for the plant that Jacquin actually had and described, namely *Bothriospermum tenellum*, leaving the question simply one of priority of publication.

To Dr. C. H. Ostenfeld, I am greatly indebted not only for copies from the three publications here cited, but also for a reëxamination of the specimen in Vahl's herbarium.

Northwestern Himalayas to Japan and Formosa.

10. **TRIGONOTIS** Stev.

Trigonotis philippinensis Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 228.

LUZON, Province of Benguet, Pauai to Baguio, *Merrill 4700;* Pauai, *Bur. Sci. 4442 Mearns;* Mount Pulog, *For. Bur. 16104 Curran Merritt & Zschokke.*

Endemic, much the farthest southeastern extension of the genus.

Young flowers of this species, when compared with others taken from Indian material of *Eritrichium strictum* Decne., showed about equal curvature of the receptacle in the two species: in fruiting specimens of *T. philippinensis* the

receptacle is quite flat, moreover the tetrahedral nutlets are quite as in *Trigonotis*, though proportionally somewhat longer than in any Indian species, and quite different from those of any *Eritrichium*.

The name of this genus, under the Vienna code, is *Endogonia* Lindl., dating from 1847, while *Trigonotis* was published in 1851. There is a still older *Endogona* of Rafinesque, 1836, not a valid genus, as it is universally reduced to *Anthericum* Linn., but quite sufficient to prevent the employment of Lindley's name here.

STUDIES IN THE VEGETATION OF THE PHILIPPINES.
I. THE COMPOSITION AND VOLUME OF THE DIPTEROCARP FORESTS OF THE PHILIPPINES.

By H. N. WHITFORD.

(*From the Bureau of Forestry, Manila, P. I.*)

SUMMARY OF CONCLUSIONS.

I. The virgin forest area of the Philippines comprises approximately 40,000 square miles or about one-third the total area.

II. Seventy-five per cent of the virgin forest area (30,000 square miles) is covered with forests in which the members of the dipterocarp family predominate.

III. The members of the dipterocarp family, comprising an average of 75 per cent of the volume, can, from a forester's and lumberman's standpoint, be divided into three tree groups, viz, the hard and durable yacals, the apitongs, and the lauans.

IV. The apitongs and lauans can furnish by far the greatest amount of timber. The apitongs can be favorably compared to the hard pines in general mechanical properties, the lauans, to the soft pines.

V. From many standpoints the dipterocarp family is to the Philippines what the pine and oak families are to the United States and other temperate countries.

VI. Success in virgin forest growth should be measured in terms of bulk or bulk and annual increment combined.

VII. The nearer the climatic, edaphic, and biotic conditions reach the optimum, the heavier the bulk of the forest and the simpler the systematic arboreal composition.

VIII. If measured in bulk alone, some temperate regions as compared with the Philippines show greater success in forest growth. If annual increment is used in combination with bulk, the forests of the Philippines will compare favorably with forest growth in temperate regions.

IX. If the tropics in general are like the Philippines in the above respects, they can be depended on to produce woods to compete with general construction timbers grown in temperate regions.

X. An inventory of the forest resources of other tropical regions will give scientific and economic results of great importance.

INTRODUCTION.

An estimate of the capacity of any region to produce and maintain a virgin forest presupposes a standard of comparison by which to judge success in forest growth.

What is meant by success depends on the investigator's standpoint. Those who critically examine forest growth can, I think, be roughly divided into four classes. These are systematic botanists, ecological botanists, lumbermen, and foresters. The systematic botanist would usually consider the most successful forest to be that which contains on a unit of surface the greatest number of species of all kinds from the ground to the tops of the highest trees. On the above idea, variety in species and form are the main points considered. Thus the forest is composed of a great many species assuming in outline a great many forms, such as lichens, mosses, liverworts, herbs, epiphytes, parasites, climbing bamboos and palms and dicotyledonous trees. He usually brings his material together in the form of a "flora," associating plants in groups or families. Thus a qualitative analysis is made of the forest. The idea of bulk is expressed in vague terms, associated with different species, like "common" or "abundant," "a large tree," "a liana," etc. A brief description of the region usually precedes the lists of plants. This is the conventional idea of the tropical forests and those people, who disregard value as an element of success would place such a forest as the most successful in the world.

The ecological botanist will consider habitat as well as vegetation. He will divide the forest into formations or societies, or types, corresponding to the different habitats, and then describe each forest type in greater or less detail, calling attention qualitatively, and more or less quantitatively, to the composition of the forest. He may or may not make an attempt to measure, or express in some way, the factors of the habitat. To him the best physical and biotic conditions produce the best or most successful forest which he calls a mesophytic forest. The idea of "succession" may or may not be considered. In the above ideas there is little or no attempt to measure the amount of vegetation per unit of surface, hence they may be designated as qualitative standards in distinction from the quantitative standards, viz, the standard of the lumberman and the forester.

The lumberman takes into consideration "value" as an element of success in forest growth. Any given forest would be judged by the trees suitable for his needs and the rest would be considered as "weed trees." As the cost of handling a large amount and a few kinds of lumber is less than in handling a small amount and many kinds on any given area, he desires to obtain a great bulk of one or of very few kinds of timber per unit of area. To him the most successful forest in the world would be the greatest amount of the most valuable timbers of the most con-

venient size best situated, so as to yield the highest profits to immediate utilization.

The forester would inject into the lumberman's view the idea of increment for the sake of future yields and the possibility that the woods which he now considers as valueless, may, in a readjustment of market conditions, become valuable. In other words, the forester's standard of success is the earning capacity of the forest as a permanent investment.

These four views, the systematic botanist's, containing the idea of variety associated (consciously or not) with bulk; the ecologist's, associating the idea of bulk and variety with habitat; the lumberman's, considering the variety and bulk of wood necessary for his present needs; and the forester's, considering the variety and bulk for present and future use, are, I believe, fairly representative of the different standpoints of observing men who judge forest and forest conditions. An ideal study of the vegetation of a forest would be a combination of all of these in which the vegetation would be arranged by habitats with the idea of succession recognized and the physical and other factors measured. A complete list of plants in each habitat could be obtained, the number (stand) of each species could be enumerated, the volume by cubic contents or weight of each plant ascertained, and the market value of each merchantable kind could be estimated.

Because of the impracticability of such a study, I propose to use bulk as measured in cubic contents as the standard of comparison by which success is judged in forest vegetation. By "bulk" I mean the amount of vegetable tissue (mainly wood) that is formed and maintained for a greater or less length of time. From this standpoint the unit of area (of a size large enough to be considered a "region") that produces and is able to maintain for some time the greatest amount of vegetable tissue per unit of surface is the most successful. I am purposely leaving out of account the idea of annual increment, principally because it is impracticable at present to give any figures showing this. In a general way the influence of this element of success will be used in certain conclusions at the close of this paper. The measuring of the forest by weight per unit of surface would perhaps be a better standard of comparison. This could easily be obtained with the volume and specific gravity of each kind of wood mentioned. The idea of judging by value is disregarded because it would not be a stable standard of comparison.

It is proposed to confine the discussions of the dipterocarp forests in this paper to the dicotyledonous trees and after a preliminary discussion on the composition of the forest with a mention of trees of all sizes, to limit the studies to those trees above a certain diameter. That the forest is composed of plants other than dicotyledonous trees goes without saying. Most descriptions of tropical forests give, I think, undue importance to these other elements. Thus one gains the impression that

tree palms, epiphytic orchids and ferns, insectivorous plants, large lianas and the like are the main features of tropical forests, principally because these forms are not as a rule present in temperate regions and consequently are more apt to force themselves upon investigators from temperate regions. After all, these peculiar forms are only ornaments that a tropical climate permits. Stripped of their showy forms the tropical forests of the Philippines are more nearly like temperate forests than they are different from them.

To measure the entire bulk of any forest is impracticable. It is therefore proposed to apply the methods used by lumbermen and foresters, viz, rough cruising and valuation surveys.

While the measurement of the merchantable "bulk" of the forest is not by any means the entire bulk, yet for the purposes of this paper it can be used comparatively and will give a far better indication of what comprises the main bulk than merely indicating the number of trees and other plants. It may be objected that the measurement of trees of merchantable size gives undue importance to those reaching that size, and that if those species that do not reach merchantable size were measured, the proportion of the entire bulk would be greatly changed in favor of the smaller species. It must be remembered, however, that the large-sized species have small-sized unmeasured representatives and that the quantity of the latter in most instances would be as great as the entire bulk of the other species that do not reach merchantable sizes. Then the great amount of bulk in the branches of the large trees would add greatly to the bulk of the principal species. All things considered, it is believed that if the entire woody bulk of the forest could be measured the relative proportion of the principal family would be even greater than that shown in the tables given below.

In most of the discussions on the composition and volume given below no attempt is made to arrange the forests under discussion in "types." That "types" do exist is without question, but a discussion of such types and their composition and volume is reserved for another paper.

FORESTS IN BATAAN PROVINCE.

In a previous paper [1] by the author the results of a quantitative analysis of the arboreal composition of a number of measured plots was given. In these no consideration of volume was taken other than that all trees under 4 meters in height were excluded.

In order to give a more comprehensive idea of the volume, one [2] of these tables taken at random has been copied and then rearranged.

Table I illustrates the complexity qualitatively and quantitatively.

[1] Whitford, H. N. The Vegetation of the Lamao Forest Reserve. *This Journal* 1 (1906) 373–431; 637–682.

[2] Loc. cit. 637, 638.

It shows that, on an area of 8,325 square meters (a little over 2 acres) there are 1,160 trees (representing 85 species) over 4 meters in height. Column A gives the number of trees and B the percentage of each.

TABLE I.

Name of plant.	A.	B.	Name of plant.	A.	B.
1. *Dipterocarpus grandiflorus* Blanco	182	15.7	37. *Litsea fulva* F.-Vill.	4	-------
2. *Shorea polysperma* Merr.	134	11.5	38. *Myristica philippensis* Lam.	4	-------
3. *Memecylon edule* Roxb.	94	8.1	39. *Sideroxylon duclitan* Blanco	4	-------
4. *Aporosa sphaeridophora* Merr.	81	7.0	40. *Talauma villariana* Rolfe	4	-------
5. *Ternstroemia toquian* F.-Vill.	66	5.7	41. *Antidesma edule* Merr.	3	-------
6. *Diospyros pilosanthera* Blanco	59	5.1	42. *Ficus* sp.	3	-------
7. *Santiria nitida* Merr.	52	4.5	43. *Aglaia harmsiana* Perk.	2	-------
8. *Calophyllum blancoi* Pl. & Tr.	46	4.1	44. *Champereia cumingiana* Merr.	2	-------
9. *Pentacme contorta* Merr. & Rolfe	41	3.5	45. *Eugenia* sp.	2	-------
10. *Cyclostemon microphyllum* Merr.	30	2.6	46. *Eugenia* sp.	2	-------
11. *Eugenia glaucicalyx* Merr.	26	2.2	47. *Grewia stylocarpa* Warb.	2	-------
12. *Cinnamomum mercadoi* Vid.	23	2.0	48. *Mangifera altissima* Blanco	2	-------
13. *Aporosa symplocosifolia* Merr.	22	1.9	49. *Pygeum glandulosum* Merr.	2	-------
14. *Semecarpus perrottetii* March.	22	1.9	50. *Shorea* sp.	2	-------
15. *Hopea acuminata* Merr.	20	1.7	51. *Sterculia brevipetiolata* Merr.	2	-------
16. *Quercus* sp.	17	1.6	52. *Linociera* sp.	2	-------
17. *Kayea paniculata* Merr.	15	1.3	53. *Unona clusiflora* Merr.	2	-------
18. *Litchi philippinensis* Radlk.	15	1.3	54. *Aglaia bordenii* Merr.	1	-------
19. *Plectronia viridis* Merr.	12	1.0	55. *Albizzia procera* Benth.	1	-------
20. *Euphoria cinerea* Radlk	12	1.0	56. *Ardisia philippinensis* A. DC.	1	-------
21. *Shorea guiso* Blume	12	1.0	57. *Artocarpus communis* Forst.	1	-------
22. *Ellipanthus luzoniensis* Vid.	10	(a)	58. *Buchanania arborescens* Bl.	1	-------
23. *Symplocos oblongifolia* Rolfe	10	-------	59. *Citrus hystrix* DC.	1	-------
24. *Vatica mangachapoi* Blume	10	-------	60. *Cyathocalyx globosus* Merr.	1	-------
25. *Baccaurea tetrandra* Baill.	10	-------	61. *Dipterocarpus vernicifluus* Blanco	1	-------
26. *Eugenia* sp.	8	-------	62. *Ficus* sp.	1	-------
27. *Pandanus luzoniensis* Merr.	8	-------	63. *Guioa* sp.	1	-------
28. *Anisoptera thurifera* Blanco	6	-------	64. *Ixora* sp.	1	-------
29. *Calophyllum whitfordii* Merr.	6	-------	65. *Ixora* sp.	1	-------
30. *Gonocaryum calleryanum* Becc.	6	-------	66. *Memecylon* sp.	1	-------
31. *Ormosia calavensis* Blanco	6	-------	67. *Michelia cumingii* Merr. & Rolfe	1	-------
32. *Knema heterophylla* Warb.	6	-------	68. *Mitrephora merrillii* C. B. Rob.	1	-------
33. *Excoecaria philippinensis* Merr.	5	-------	69. *Pahudia rhomboidea* Prain	1	-------
34. *Dimorphocalyx longipes* Merr.	4	-------	70. *Palaquium tenuipetiolatum* Merr.	1	-------
35. *Kopsia longiflora* Merr.	4	-------	71. *Randia* sp.	1	-------
36. *Litsea luzonica* F.-Vill.	4	-------	72. *Shorea* sp.	1	-------
			73. *Voacanga* sp.	1	-------
			74 to 85. (unknown species)	12	-------
			Total (85)	1,160	-------

[a] The following have less than 1 per cent.

But when judged from the standpoint of size a quite different impression is obtained. By that standard, we should note that of the 1,160 trees only 826 (about 71 per cent) reach merchantable size (30 centimeters in diameter), that 409 of these (35 per cent of the whole number or 50 per cent of those that may reach merchantable size) are of one botanical family (the *Dipterocarpaceae*).

Table II shows the species and number of the dipterocarps found in the above mentioned plot.

TABLE II.

Name of plant.	Number.	Name of plant.	Number.
Dipterocarpus grandiflorus Blanco	182	*Vatica mangachapoi* Blume	10
Shorea polysperma Merr.	134	*Anisoptera thurifera* Blanco	6
Pentacme contorta Merr. & Rolfe	41	*Shorea* spp.	3
Hopea acuminata Merr.	20	*Dipterocarpus vernicifluus* Blanco	1
Shorea guiso Blume	12	Total	409

It will be seen that of the *Dipterocarpaceae,* two species, *Dipterocarpus grandiflorus* and *Shorea polysperma,* have 316 representatives or about 38 per cent of the total number of trees that may reach a merchantable diameter of 30 centimeters.

The following table shows the proportion of the other trees mentioned in Table I by families that may reach merchantable size when mature.

TABLE III.

Name of plant.	Number.		Name of plant.	Number.	
THEACEAE:			ANACARDIACEAE:		
1. *Ternstroemia toquian* F.-Vill.	66		15. *Semecarpus perrottetii* March.	22	
EBENACEAE:			16. *Mangifera altissima* Blanco	2	
2. *Diospyros pilosanthera* Blanco	59		17. *Buchanania arborescens* Blume	1	
BURSERACEAE:					25
3. *Santiria nitida* Merr.	52		FAGACEAE:		
GUTTIFERAE:			18. *Quercus* sp.		17
4. *Calophyllum blancoi* Pl. & Tr.	46		CONNARACEAE:		
5. *Calophyllum whitfordii* Merr.	6		19. *Ellipanthus luzoniensis* Vid.		10
		52	MYRISTICACEAE:		
MYRTACEAE:			20. *Knema heterophylla* Warb.	6	
6. *Eugenia glaucicalyx* Merr.	26		21. *Myristica philippensis* Lam.	4	
7. *Eugenia* sp.	8				10
8. *Eugenia* sp.	2		LEGUMINOSAE:		
9. *Eugenia* sp.	2		22. *Ormosia calavensis* Blanco	6	
		38	23. *Albizzia procera* Benth.	1	
LAURACEAE:			24. *Pahudia rhomboidea* Prain	1	
10. *Cinnamomum mercadoi* Vid.	23				8
11. *Litsea luzonica* F.-Vill.	4		ICACINACEAE:		
12. *Litsea fulva* F.-Vill.	4		25. *Gonocaryum calleryanum* Becc.		6
		31	SAPOTACEAE:		
SAPINDACEAE:			26. *Sideroxylon duclitan* Blanco	4	
13. *Litchi philippinensis* Radlk.	15		27. *Palaquium tenuipetiolatum* Merr.	1	
14. *Euphoria cinerea* Radlk.	12				5
		27			

TABLE III—Continued.

Name of plant.	Number.		Name of plant.	Number.
MELIACEAE:			ROSACEAE:	
28. *Aglaia harmsiana* Perk.	2		32. *Pygeum glandulosum* Merr.	2
29. *Aglaia bordenii* Merr.	1		MORACEAE:	
		3	33. *Artocarpus communis* Forst.	1
OPILIACEAE:			ANONACEAE:	
30. *Champereia cumingiana* Merr.		2	34. *Cyathocalyx globosus* Merr.	1
TILIACEAE:			Total	417
31. *Grewia stylocarpa* Warb.		2		

While all the trees mentioned above may in exceptional cases reach a diameter limit of 30 centimeters, as a matter of fact most of them will reach when mature not over 40 centimeters in diameter and very few of them have the power to reach the diameter and height of some of the dipterocarps.

If bulk were taken into consideration the proportion of the dipterocarps would be much greater. This will be shown in another connection.

The 334 remaining trees that can not reach, when mature, 30 centimeters in diameter will not average over 15 centimeters in diameter. Strange to say, while 40 species are represented in these, the vast majority of them are distributed among species of the *Euphorbiaceae* and *Melastomataceae*. Thus *Memecylon edule* Roxb. (*Melastomataceae*) is represented by 94 trees, and *Aporosa sphaeridophora* Merr. by 81, *Cyclostemon microphyllum* Merr. by 30, *Aporosa symplocosifolia* Merr. by 22, and *Baccaurea tetrandra* Baill. by 10. The last four named belong to the *Euphorbiaceae*.

It might be argued that plots adjoining the one given above might greatly increase the number of species. While this is true to a certain extent, yet the possibilities are not great when it is known that on the Lamao Forest Reserve comprising 4,426 hectares and ranging in altitude from sea level to 1,406 meters there have been listed so far 548 tree species. This covers the trees of all habitats from those where introduced tree species are found to the mossy forests on top of the highest peaks. It is to be expected that the variety of habitats thus represented would bring about a variety in tree species peculiar to those habitats. Thus beach and mangrove habitats show distinct sets, river bottoms others, the mossy forest and various types of dipterocarp forest still others. It should be noted here that all eight of the dipterocarps found on the Lamao Forest Reserve of 4,426 hectares are also found on the plot given above comprising less than one hectare. At the time I wrote the "Vegetation of the Lamao Forest Reserve" the significance of the above did not

appeal to me as my studies had not been extensive enough to reach certain conclusions that have since become apparent.

The figures given above, showing that about 50 per cent of the actual number of trees over 4 meters in height on one hectare are members of one family, are significant not only from an ecological standpoint but from a lumberman's standpoint.

Since they were compiled, various parts of the Islands have been studied in detail and still larger areas have been visited so that the conclusions reached herein have solid foundations. The work of other men coöperating with me shows similar results.

Previous to my work on the Lamao Forest Reserve, Bryant [3] made valuation surveys on the Lamao River basin, in Bataan Province. In general, his figures show the predominance of the dipterocarps both in stand and bulk. His statement concerning this family is as follows:

"In the region south of a line drawn from Bagac on the west coast to Lamao to the east coast, an area of approximately 65,900 acres, * * * a detailed examination was made of the forest. In this part of the province the family of the *Dipterocarpaceae* reaches a fine development and constitutes the bulk of the merchantable timber." [4]

Unfortunately for the purposes of this paper all trees of a merchantable size were not considered by Bryant so the exact proportion of dipterocarps to all others can not be given.

A recent estimate of the stand and volume of all timber over 40 centimeters in diameter was made on a tract of land covering approximately 50 hectares near Limay, Bataan Province. This tract is immediately adjacent to that covered by Bryant. All trees on this tract above 40 centimeters were counted and the volume was obtained by the sample tree method. The altitudinal range is from 170 to 425 meters. The following shows the stand in this forest:

[3] Preliminary report on working plan of Bataan Province. Report of the Bureau of Forestry of the Philippine Islands, from July 1, 1901 to September 2, 1902, from the Report of the Philippine Commission, pp. 483–500.

[4] Loc. cit. p. 484.

TABLE IV.—*Stand on 50 (49.49) hectares on Limay (Bataan) tract—all trees 40 centimeters and over counted.*

Scientific name.	Common name.	Number of trees per hectare.	Per cent.
DIPTEROCARPACEAE:			
Dipterocarpus grandiflorus Blanco	Apitong	12	17.3
Dipterocarpus vernicifluus Blanco	Panao		
Pentacme contorta Merr. & Rolfe	White lauan	19.6	28.6
Anisoptera thurifera Blanco	Palosapis	4.6	6.6
Shorea polysperma Merr.	Tanguile	5.1	7.3
Shorea guiso Blume	Guijo	.8	1.1
Total *Dipterocarpaceae*		42.1	60.9
All others		27	39.1
Total		69.1	100.0

Among the others the following were noted:

FAGACEAE-*Quercus* spp.; ULMACEAE-*Celtis* sp.; MORACEAE-*Artocarpus communis* Forst., *Ficus variegata* Blume and other *Ficus* spp.; OLACACEAE-*Strombosia philippinensis* Rolfe; ANONACEAE-*Xylopia dehiscens* Merr., *Cyathocalyx globosus* Merr.; MYRISTICACEAE-*Myristica philippensis* Lam., *Knema heterophylla* Warb.; LAURACEAE-*Cinnamomum mercadoi* Vidal, *Litsea* spp., *Endiandra coriacea* Merr.; ROSACEAE-*Pygeum glandulosum* Merr., *Parinarium griffithianum* Benth.; LEGUMINOSAE-*Pithecolobium acle* Vid., *Adenanthera intermedia* Merr., *Parkia roxburghii* G. Don, *Pahudia rhomboidea* Prain; BURSERACEAE-*Canarium* spp., *Santiria nitida* Merr.; MELIACEAE-*Dysoxylum* spp., *Reinwardtiodendron merrillii*, *Amoora* spp., *Aglaia* spp.; POLYGALACEAE-*Xanthophyllum* sp.; EUPHORBIACEAE-*Bischofia trifoliata* Hook., *Macaranga bicolor* Muell.-Arg., *Macaranga tanarius* Muell.-Arg., *Endospermum peltatum* Merr.; ANACARDIACEAE-*Mangifera altissima* Blanco, *Dracontomelum cumingianum* Baill., *Dracontomelum dao* Merr. & Rolfe, *Koordersiodendron pinnatum* Merr., *Semecarpus perrottetii* March.; SAPINDACEAE-*Euphoria cinerea* Radlk., *Pometia pinnata* Forst.; RHAMNACEAE-*Zizyphus zonulatus* Blanco; STERCULIACEAE-*Pterospernum* spp., *Pterocymbium tinctorium* Merr.; DILLENIACEAE-*Dillenia philippinensis* Rolfe; GUTTIFERAE-*Calophyllum blancoi* Pl. & Tr., *Calophyllum whitfordii* Merr.; DIPTEROCARPACEAE-*Hopea acuminata* Merr., *Vatica mangachapoi* Blanco; DATISCACEAE-*Octomeles sumatrana* Miq.; LYTHRACEAE-*Lagerstroemia speciosa* Pers.; COMBRETACEAE-*Terminalia* spp.; MYRTACEAE-*Eugenia* spp.; SAPOTACEAE-*Illipe ramiflora* Merr., *Palaquium luzoniense* Vid., *Palaquium tenuipetiolatum* Merr.; EBENACEAE-*Diospyros pilosanthera* Blanco; APOCYNACEAE-*Alstonia scholaris* R. Br.; VERBENACEAE-*Vitex littoralis* Decne.; BIGNONIACEAE-*Radermachera pinnata* Seem.

On the above mentioned plot there were counted in all 3,458 trees; of these 2,110 belong to the enumerated dipterocarps (*Hopea acuminata* and *Vatica mangachapoi* not being included) and the remainder 1,348 distributed among the remaining of which the list given above is fairly representative. An examination of this list shows that there are included 29 families and over 60 species.

The following table gives the volume on the Limay tract:

TABLE V.—*Volume on 50 (49.49) hectares on the Limay (Bataan) tract—all trees 40 centimeters and over included.*

Scientific name.	Common name.	Cubic meters per hectare.	Per cent.
DIPTEROCARPACEAE:			
Dipterocarpus grandiflorus Blanco	Apitong	81.6	28.6
Dipterocarpus vernicifluus Blanco	Panao		
Pentacme contorta Merr. & Rolfe	White lauan	66.5	23.3
Anisoptera thurifera Blanco	Palosapis	28	9.8
Shorea polysperma Merr.	Tanguile	16	5.6
Shorea guiso Blume	Guijo	4.1	1.5
Total *Dipterocarpaceae*		196.2	68.8
All others		89.0	31.2
Total		285.2	100.0

Tables IV and V show that 60.9 per cent of the stand and 68.8 per cent of the volume respectively on the above tract are composed of six species of *Dipterocarpaceae,* and that three species, viz, *Dipterocarpus grandiflorus, Dipterocarpus vernicifluus* and *Pentacme contorta* form 45.9 per cent of the stand and 51.9 per cent of the volume.

FORESTS ON A DELTA PLAIN IN MINDORO.

In coöperation with M. L. Merritt, a tract of land on the east coast of Mindoro comprising some 55 square miles was examined. This is a delta formation, slightly raised, forming a number of different physiographic units. Corresponding to these are distinct vegetative types. In this connection it is not important to distinguish between these. After some intensive study to learn to distinguish the numerous kinds of trees found on the tract, valuation surveys were run by what is known

as the strip method. All through the work botanical collections were made, by felling trees if necessary, in order to check up the identifications. Thus such identifications as were made were checked up in Manila and those that could not be made were determined by systematic botanists. Thus a fair idea was obtained of the composition of the forest.[5]

Tables VI and VII show the stand of timber on two types on the Mindoro delta plain. (All trees over 40 centimeters were measured.)

TABLE VI.—*Narra type (average of 28.4 hectares.)*

Scientific name.	Common name.	Number of trees per hectare.	Per cent.
DIPTEROCARPACEAE:			
Pentacme contorta Merr. & Rolfe	White lauan	14.811	22.23
Shorea guiso Blume	Guijo	4.243	6.37
Dipterocarpus sp.	Apitong	2.555	3.83
Dipterocarpus affinis Brandis	Hagachac	.450	.68
Total *Dipterocarpaceae*		22.059	33.11
LEGUMINOSAE:			
Pterocarpus indicus Willd.	Narra	4.769	7.16
ANACARDIACEAE:			
Koordersiodendron pinnatum Merr.	Amuguis	4.702	7.06
Dracontomelum dao Merr. & Rolfe	Dao	3.395	5.10
MELIACEAE?	Agupanga?	4.709	7.07
COMBRETACEAE:			
Terminalia pellucida Presl	Malagabi	1.322	1.98
Terminalia nitens Presl	Sacat		
Terminalia edulis Blanco	Calumpit		
BURSERACEAE:			
Canarium luzonicum A. Gray	Pili	1.048	1.57
Canarium villosum F.-Vill.	Pagsahinguin		
ULMACEAE:			
Celtis sp.	Malaguibuyo	3.126	4.69
All others[6]		21.498	32.26
Total		66.628	100

[5] For a more detailed statement of the composition and character of this forest see Merritt, M. L. and Whitford, H. N. A Preliminary Working Plan for the Public Forest Tract of the Mindoro Lumber and Logging Company, Bongabon, Mindoro, P. I. Bureau of Forestry (Philip.) Bulletin 6 (1906) 1–55.

[6] See Merritt & Whitford *l. c.*, 53–55, for list.

TABLE VII.—*Hagachac type (average of 14 hectares.)*

Scientific name.	Common name.	Number of trees per hectare.	Per cent.
DIPTEROCARPACEAE:			
Pentacme contorta Merr. & Rolfe	White lauan	11.016	18.28
Dipterocarpus affinis Brandis	Hagachac	10.519	17.45
Shorea guiso Blume	Guijo	3.338	5.54
Dipterocarpus sp.	Apitong	.141	.23
Total *Dipterocarpaceae*		25.014	41.50
LEGUMINOSAE:			
Pterocarpus indicus Willd.	Narra	.568	.95
ANACARDIACEAE:			
Koordersiodendron pinnatum Merr.	Amuguis	3.625	6.01
Dracontomelum dao Merr. & Rolfe	Dao	3.907	6.48
MELIACEAE?	Agupanga?	6.326	10.50
ULMACEAE:			
Celtis sp.	Malaguibuyo	3.128	5.19
BURSERACEAE:			
Canarium luzonicum A. Gray	Pili	1.354	2.25
Canarium villosum F.-Vill.	Pagsahinguin		
COMBRETACEAE:			
Terminalia pellucida Presl	Malagabi	.994	1.65
Terminalia nitens Presl	Sacat		
Terminalia edulis Blanco	Calumpit		
All others		15.352	25.47
Total		60.268	100

It will be seen by the above that in the *narra* type approximately 22 trees out of every 66 and in the *hagachac* type 25 out of every 60 trees per hectare are dipterocarps or respectively 33.11 per cent and 41.50 per cent of all trees over 40 centimeters.

Unfortunately for the purposes of this paper the volume tables published in Bulletin 6, showing the cubic contents of timber per unit of area do not include all of the species. But the results given below showing the proportion of dipterocarps are not far from the actual proportion, for a large per cent of the species not mentioned show a maximum diameter of not over 45–50 centimeters and short boles usually one-fifth to one-third the length of the boles of the dipterocarps. Four species, *Dracontomelum, agupanga* and two species of *Canarium* mentioned in the stand tables are not included in the tables below. *Agupanga* has a short bole usually about one-fifth the length of any of the dipterocarps of the same diameter. While the bole of the Canarium is somewhat longer yet the number of trees per hectare is small. Neither *agupanga* nor the Canariums attain the maximum diameter of the dipterocarps. *Dracontomelum dao* on the other hand, reaches a maximum of 140 centi-

meters, the maximum of *Pentacme contorta,* but the bole is invariably shorter in trees of the same diameter.

Tables VIII and IX show the volume in the two types mentioned in Table VI and VII.

TABLE VIII.—*Narra type.*

Scientific name.	Common name.	Average per hectare.	Per cent.
		Cubic meters.	
DIPTEROCARPACEAE:			
Pentacme contorta Merr. & Rolfe	White lauan	62.55	37
Shorea guiso Blume	Guijo	14.90	8.8
Dipterocarpus sp.	Apitong	11.03	6.5
Dipterocarpus affinis Brandis	Hagachac	2.39	1.4
Total *Dipterocarpaceae*		90.87	53.7
LEGUMINOSAE:			
Pterocarpus indicus Willd.	Narra	12.50	7.4
ANACARDIACEAE:			
Koordersiodendron pinnatum Merr.	Amuguis	12.08	7.2
COMBRETACEAE:			
Terminalia pellucida Presl	Malagabi	3.75	2.2
Terminalia nitens Presl	Sacat		
Terminalia edulis Blanco	Calumpit		
All others (estimated)		50.00	29.5
Total		169.20	100

TABLE IX.—*Hagachac type.*

Scientific name.	Common name.	Average per hectare.	Per cent.
		Cubic meters.	
DIPTEROCARPACEAE:			
Pentacme contorta Merr. & Rolfe	White lauan	42.4	28.1
Dipterocarpus affinis Brandis	Hagachac	43.3	28.7
Shorea guiso Blume	Guijo	13.7	9.1
Dipterocarpus sp.	Apitong	.2	.1
Total *Dipterocarpaceae*		99.6	66.0
LEGUMINOSAE:			
Pterocarpus indicus Willd.	Narra	1.3	.9
ANACARDIACEAE:			
Koordersiodendron pinnatum Merr.	Amuguis	7.9	5.2
COMBRETACEAE:			
Terminalia pellucida Presl	Malagabi	1.9	1.3
Terminalia nitens Presl	Sacat		
Terminalia edulis Blanco	Calumpit		
All others (estimated)		40.0	26.6
Total		150.7	100

The figures show the percentage of bulk of the dipterocarps in the two types to be respectively 53.7 per cent and 66 per cent, a percentage that is much higher than that of the stand, indicating that the volume of these trees averages higher than that of the other species.

FORESTS IN NORTHERN NEGROS.

On the lower slopes of Mount Silay, Negros, is a large body of timber. In coöperation with H. D. Everett, this region was investigated.

The work was done on a lumber concession containing about 16,000 hectares of solid dipterocarp forest. The tract lies on the lower slopes of Mount Silay just back of the coastal strip of cultivated sugar lands, here about 10 kilometers wide. It is situated on both sides of the Himugaan River. The land is characterized by gentle slopes, with alternating ridges; the elevation ranges from 30 to 370 meters. Small streams and arroyos are scattered profusely over the tract.[7]

The methods used in estimating the stand and determining the composition of the forest were identical with those in Mindoro.

Tables X and XI show the stand and volume of the forest.

TABLE X.—*Stand of trees 40 centimenters and over in diameter in northern Negros (average of 54.65 hectares).*

Scientific name.	Common name.	Number of trees per hectare.	Per cent.
DIPTEROCARPACEAE:			
Dipterocarpus grandiflorus Blanco	Apitong	19.158	23.6
Shorea furfuracea Miq.?	Almon lauan	16.178	19.9
Shorea polysperma Merr.	Tanguile	11.32	13.9
Shorea sp.	Red lauan	20.854	25.7
Pentacme contorta Merr. & Rolfe	White lauan	5.114	6.3
Parashorea plicata Brandis	Bagtican lauan		
Total *Dipterocarpaceae*		72.624	89.4
All others		8.626	10.6
Total		81.250	100

The significance of these figures, showing a dipterocarp stand of 72.624 trees per hectare out of a total of 81.250 and a percentage of 89.4 needs no comment.

Diospyros mindanaensis Merr. (*Ebenaceae*) and *Vitex aherniana*

[7] Everett, H. D. and Whitford, H. N. A Preliminary Working Plan for the Public Forest Tract of the Insular Lumber Company, Negros Occidental, P. I. Bureau of Forestry (Philip.) Bull. 5 (1906) 1–54.

Merr. (*Verbenaceae*) with a stand of 1.4 and 0.95 trees respectively per hectare are the only two other species of any numerical importance in this forest, though the following species occur very scattered: *Hopea philippinensis* Dyer and *Hopea acuminata* Merr., (*Dipterocarpaceae*), *Calophyllum* sp., (*Guttiferae*), *Eugenia* spp., (*Myrtaceae*), *Canarium* sp., and *Santiria nitida* Merr., (*Burseraceae*), *Palaquium* spp., (*Sapotaceae*), *Terminalia* spp., (*Combretaceae*), *Koordersiodendron pinnatum* Merr., *Dracontomelum dao* Merr. & Rolfe, *Mangifera altissima* Blanco, (*Anacardiaceae*), *Macaranga tanarius* Muell.-Arg., (*Euphorbiaceae*), *Dillenia* sp., (*Dilleniaceae*), *Neolitsea* sp., (*Lauraceae*), and *Artocarpus communis* Forst., (*Moraceae*).

The volume of the dipterocarps is given in the following table. The minor species are not included in this estimate because of their small numbers and comparative unimportance.

TABLE XI.—*Volume per hectare of the six principal species 40 centimeters and over in diameter on a tract in northern Negros (average of 54.65 hectares).*

Species.	Common name.	Average per hectare.
		Cubic meters.
Dipterocarpus grandiflorus Blanco	Apitong	66.63
Shorea furfuracea Miq. ?	Almon	92.02
Shorea polysperma Merr.	Tanguile	59.93
Shorea sp.	Red lauan	185.18
Pentacme contorta Merr. & Rolfe	White lauan	25.23
Parashorea plicata Brandis	Bagtican lauan	
Total		428.99

While the figures of the stand show 89.4 per cent of dipterocarps it is estimated that the six species given above comprise more than 95 per cent of the total bulk of the forest.

FORESTS IN AROROY REGION, MASBATE.

On a detail to investigate the forest resources of the Aroroy mining region in Masbate rough estimates of stand were made. This study, comprising 200 square kilometers, is more than half in forest. The topography is rough and consists of sharp ranges of hills and higher and more resistant peaks. The hills are about 125 to 150 meters in altitude and the highest peak is 362 meters. Approximately 80 per cent of the forested area, distinguished as the lower slope type, is distinctly dipterocarpous in nature.

The following shows its character:

TABLE XII.—*Stand of trees 30 centimeters and over in diameter on the lower slope type of the Aroroy region, Masbate (average of 16 acres).*

Scientific name.	Common name.	Average number of trees per hectare.	Per cent.
DIPTEROCARPACEAE:			
Parashorea plicata Brandis	Bagtican lauan	47.5	56.88
Shorea guiso Blume	Guijo	.7	.82
COMBRETACEAE:			
Terminalia quadrialata Merr.	Toog	12	14.36
STERCULIACEAE:			
Sterculia blancoi Rolfe	Magalipac	4.2	5.02
ANACARDIACEAE:			
Dracontomelum dao Merr. & Rolfe	Dao	1.7	2.02
Koordersiodendron pinnatum Merr.	Amuguis	.5	.6
LEGUMINOSAE:			
Pterocarpus indicus Willd.	Narra	1.5	1.8
OLACACEAE:			
Strombosia philippinensis Rolfe	Tamayuan	.9	1.1
All others		14.5	17.4
Total		83.5	100

It is thus to be noted that 47 trees out of 83, or approximately 57 per cent of the stand, belong to two species of the dipterocarps. A discussion of the other types of forest in this region is reserved for another paper.

FORESTS OF THE ZAMBOANGA PENINSULA IN MINDANAO.

In coöperation with W. I. Hutchinson, the forests of a lumber concession located at Port Banga at the head of Zamboanga Peninsula on the Island of Mindanao were investigated. The work here was similar to that accomplished in Mindoro and Negros. This tract, comprising 355 square kilometers, has about 52 per cent (or 186 square kilometers) in virgin forest. Of this, 16,144 hectares or 86.37 per cent is forest in which the dipterocarps predominate.

The topography of the region is rough and broken. It is composed mostly of low irregular ridges 15 to 100 meters in height extending into headlands bordering on the sea. These lead inward to the base of the mountains. The rivers are small and beyond tidal limits are hill streams with cañon-like valleys whose beds are full of bowlders and rock outcrops. Tables XIII and XIV show the stand and volume on two types.

TABLE XIII.—*Stand in yacal type—trees 40 centimeters and over in diameter—Port Banga, Zamboanga, Mindanao:* (*average of 51.17 hectares*).

Scientific name.	Common name.	Average number of trees per hectare.	Per cent of total stand.
DIPTEROCARPACEAE:			
Hopea plagata Vid.	Yacal	12.41	15.59
Pentacme contorta Merr. & Rolfe	White lauan	7.24	9.10
Parashorea plicata Brandis	Bagtican lauan		
Dipterocarpus sp.	Apitong	3.875	4.87
Shorea guiso Blume	Guijo	3.335	4.19
Vatica sp.	Narig	2.535	3.19
(?)	Calunti lauan	2.38	2.99
Shorea squamata Turcz. ?	Danlig lauan	2.175	2.72
Shorea furfuracea Miq. ?	Almon lauan		
Hopea ? sp.	Malayacal	1.025	1.29
Total *Dipterocarpaceae*		34.975	43.94
STERCULIACEAE:			
Tarrietia javanica Blume	Lumbayao	7.23	9.08
LEGUMINOSAE:			
Kingiodendron alternifolium Merr. & Rolfe	Batete	3.59	4.51
All others		33.785	42.47
Total		79.580	100

TABLE XIV.—*Stand in lauan type—trees 40 centimeters and over in diameter—Port Banga, Zamboanga, Mindanao:* (*average of 15 hectares*).

Scientific name.	Common name.	Average number of trees per hectare.	Per cent of total stand.
DIPTEROCARPACEAE:			
Pentacme contorta Merr. & Rolfe	Bagtican lauan	13.38	16.59
Parashorea plicata Brandis	White lauan		
Shorea squamata Turcz. ?	Danlig lauan	6.27	7.77
Shorea furfuracea Miq. ?	Almon lauan		
Dipterocarpus sp.	Apitong	4.47	5.54
(?)	Calunti lauan	3.46	4.29
Hopea ? sp.	Malayacal	3.28	4.07
Shorea guiso Blume	Guijo	2.73	3.38
Hopea plagata Vid.	Yacal	2.40	2.98
Vatica sp.	Narig	1.00	1.24
Total *Dipterocarpaceae*		36.99	45.86
STERCULIACEAE:			
Tarrietia javanica Blume	Lumbayao	3.74	4.64
LEGUMINOSAE:			
Kingiodendron alternifolium Merr. & Rolfe	Batete	3.07	3.81
All others		37.41	45.69
Total		81.21	100

TABLE XV.—*Yield in yacal type—trees 40 centimeters and over in diameter (average of 51.17 hectares).*

Scientific name.	Common name.	Average per hectare.	Per cent of total stand.
DIPTEROCARPACEAE:		*Cubic meters.*	
Hopea plagata Vid.	Yacal	50.37	17.4
Pentacme contorta Merr. & Rolfe	White lauan	26.02	9.0
Parashorea plicata Brandis	Bagtican lauan		
Dipterocarpus sp.	Apitong	12.05	4.2
Shorea guiso Blume	Guijo	16.80	5.7
(?)	Calunti lauan	12.34	4.3
Shorea squamata Turez. ?	Danlig lauan	9.46	3.3
Shorea furfuracea Miq.?	Almon lauan		
Vatica sp.	Narig	6.14	2.1
Hopea ? sp.	Malayacal	2.83	1.
Total *Dipterocarpaceae*		136.01	47.
STERCULIACEAE:			
Tarrietia javanica Blume	Lumbayao	21.35	7.4
LEGUMINOSAE:			
Kingiodendron alternifolium Merr. & Rolfe	Batete	7.29	2.6
All others		124.35	43
Total		289.00	100

TABLE XVI.—*Volume in lauan type—trees 40 centimeters and over in diameter (average of 15 hectares).*

Scientific name.	Common name.	Average per hectare.	Per cent of total stand.
DIPTEROCARPACEAE:		*Cubic meters.*	
Pentacme contorta Merr. & Rolfe	White lauan	51.14	17.5
Parashorea plicata Brandis	Bagtican lauan		
Shorea squamata Turcz.?	Danlig lauan	21.91	7.5
Shorea furfuracea Miq.?	Almon lauan		
(?)	Calunti lauan	17.00	5.8
Shorea guiso Blume	Guijo	13.68	4.6
Dipterocarpus sp.	Apitong	12.76	4.4
Hopea plagata Vid.	Yacal	9.09	3.1
Hopea? sp.	Malayacal	8.57	2.9
Vatica sp.	Narig	1.55	.5
Total *Dipterocarpaceae*		135.70	46.3
STERCULIACEAE:			
Tarrietia javanica Blume	Lumbayao	12.34	4.2
LEGUMINOSAE:			
Kingiodendron alternifolium Merr. & Rolfe	Batete	6.27	2.1
All others		138.42	47.4
Total		292.73	100

These figures show the bulk of dipterocarps to be not so high here as in some other forests, yet the preponderance of that family is still too apparent to be overlooked.

The following, giving some idea of the composition of the forest, is a list of the principal trees other than those mentioned in the yield and stand tables:

FAGACEAE-*Quercus* sp.; ULMACEAE-*Celtis* sp.; MORACEAE-*Artocarpus communis* Forst.; ANONACEAE-*Canangium odoratum* Baill.; MYRISTICACEAE-*Myristica* spp.; ROSACEAE-*Parinarium griffithianum* Benth.; BURSERACEAE-*Canarium* spp.; LEGUMINOSAE-*Erythrophloeum densiflorum* (Elmer) Merr., *Albizzia saponaria* Blume; EUPHORBIACEAE-*Cyclostemon* spp.; ANACARDIACEAE-*Koordersiodendron pinnatum* Merr.; SAPINDACEAE-*Euphoria cinerea* Radlk., *Pometia pinnata* Forst.; RHAMNACEAE-*Zizyphus zonulatus* Blanco; TILIACEAE-*Grewia stylocarpa* Warb.; STERCULIACEAE-*Pterospermum* spp., *Pterocymbium tinctorium* Merr.; GUTTIFERAE-*Calophyllum* spp., *Garcinia* spp.; DIPTEROCARPACEAE-*Hopea* spp., *Anisoptera* sp.; LYTHRACEAE-*Lagerstroemia piriformis* Koehne; COMBRETACEAE-*Terminalia nitens* Presl; MYRTACEAE-*Eugenia* spp.; SAPOTACEAE-*Palaquium* spp.; EBENACEAE-*Diospyros* spp.; APOCYNACEAE-*Wrightia laniti* Merr.; VERBENACEAE-*Vitex littoralis* Decne., *Vitex aherniana* Merr.; RUBIACEAE-*Sarcocephalus cordatus* Miq.

FORESTS OF LEYTE, MINDORO, AND VARIOUS PARTS OF LUZON, AND MINDANAO.

Rough estimates of timber made in the Davao District of Mindanao show also the predominance of dipterocarps. On the Island of Samal near Davao, at least 80 per cent of the volume of the forest is composed of dipterocarps, mainly *Pentacme contorta* Merr. & Rolfe, *Parashorea plicata* Brandis, and *Shorea guiso* Blume. Untouched forests on the mainland at the head of Davao Gulf showed the dipterocarp forests reaching to the tide-water in many places and even occupying all but the frontal zones of the beaches.

The above represent regions in which more or less detailed studies have been made by the author. More hurried trips made in the Provinces of Tayabas and Camarines on the Island of Luzon, in the District of Zamboanga on the Island of Mindanao, and on the Island of Leyte, show that the large bodies of forest are composed of dipterocarps in greater or less proportion usually running over on an average 70 to 80 per cent of the bulk. The published work of Merritt[8] for Mindoro and the unpublished results of Curran, Hagger, Klemme, and other foresters in the Bureau of Forestry for various parts of the Island of Luzon, of Hutchinson for parts of Mindanao, and of Rosenbluth for northern Leyte, give results in entire confirmation of those mentioned above.

[8] M. L. Merritt. The Forests of Mindoro, Bureau of Forestry (Philip.) Bull. 8 (1908) 1–51.

SUMMARY OF STAND AND VOLUME.

The following is a summary of the stand and volume tables given in this paper.

Locality.	Per cent of *Dipterocarpaceae* by—	
	Stand.	Volume.
Bataan Province, Luzon:		
Limay	60.9	68.80
Mindoro:		
Narra type	33.11	53.70
Hagachac type	41.50	66.00
Negros	89.4	95.00
Zamboanga, Mindanao:		
Yacal type	43.7	47.00
Lauan type	45.86	46.3
Samal Island, Mindanao	----------	[a] 80
Leyte	----------	[a] 80
Masbate	47.5	----------

[a] Estimated.

It will be seen from the above that from 33 per cent to 89 per cent of the stand and 46 per cent to 95 per cent of the volume of these forests are composed of species of the *Dipterocarpaceae*. It is estimated that at least 75 per cent of the present virgin forest area comprising some 40,000 square miles is of like nature. Such a forest has been found in practically all classes of habitats from sea level to an altitude of approximately 900 meters on the largest mountain masses. Within these forests, to be sure, there are local conditions such as character of soil, steepness of slope, exposure to severe atmospheric conditions, and those due to artificial interference, that do not favor dipterocarps at the present time. However, the vegetation in many of these situations is only transitory in nature and may be considered as stages in succession toward some form of the most successful forest, viz, the dipterocarp forests. As mentioned heretofore it is not the intention to discuss in this paper the different types, nor the different stages of succession. Briefly it can be stated that a representative of a climax forest is found in Negros where the bulk reaches about 429 cubic meters per hectare of wood. Here it is believed that a combination of edaphic, climatic, and biotic factors have reached the optimum necessary to the establishment of most successful growth in the Philippines. The climate is uniform as regards temperature, and with the exception of a short dry season interspersed with showers it is fairly uniform as regards humidity and rainfall. The topography is composed of gentle slopes so that the soil wash is not great nor in the rainy season is there an accumulation of excessive moisture in the soil. It is probable that originally a greater part of the area of the Philippines

which is now under cultivation or in grass, and that has physiographic features similar to that of the Negros forest mentioned above had a forest that contained a similar composition and volume.

The forests of the Bataan and Port Banga regions on the other hand, are handicapped by less favorable climatic and edaphic conditions. The dry season is more pronounced and the topography is rough, in consequence of which the bulk of the forest is much less and the composition is more complex.

Again, the delta plain of Mindoro, which has a climate similar to that of northern Negros, during the wet season is periodically flooded by rain, which makes the soil excessively moist during a part of the year. The volume of the forest is consequently much less and the forest more complex in composition.

In temperate regions, generally speaking, the nearer success that mature forest growth attains, the simpler the arboreal composition. From the above the conclusion can be drawn that in this respect tropical virgin forests are like those found in temperate zones.

ECONOMIC CONSIDERATIONS.

The economic aspect of the predominance of dipterocarp forests in the Philippines is significant. The high percentage of the members of one family, in many places approaching pure stands, and the comparatively high bulk per unit of surface make lumbering on a large scale with modern methods possible. In the previous tables the bulk per hectare is given in cubic meters, regardless of whether the trees are sound or decayed. Making liberal allowances for unsound timber the regions investigated are conservatively estimated to run from 8,000 to 30,000 or more, board feet per acre. Individual acres will yield 100,000 or more board feet. Including all species, the volume of the dipterocarp forests in the Philippines is estimated to be about 200 billion feet of lumber board measure.

The impression is general that tropical forests yield woods that can not compete with the coniferous woods of temperate regions. Fernow[9] speaking of the lumber supplies of Australia, Brazil and other South American countries states the following:

"The valuable hardwoods of those countries, possessing excellent quality besides their beauty, for which we use them at present, will never be able to compete or supplant our own materials, for they occur in single individuals scattered among hundreds of other species; so that to supply any considerable quantity of any one kind requires culling over many acres, which renders them too expensive for general use."

What are the facts of the case as regards the Philippine forests? It is true that with the exception of very limited stands of pine, the forests

[9] Fernow, B. E. Economics of Forestry (1904) 34.

here are composed of broad-leaved trees, and would, in the United States at least, be classed as hardwoods. In texture, however, a large per cent of the trees produce woods with the general mechanical properties of pines and other conifers.

The dipterocarp woods may be divided into three groups. Of these the lauans (*Pentacme contorta, Parashorea plicata* and a number of species of *Shorea*), though slightly harder, are not dissimilar to the white pines in mechanical structure. They are being used in the Philippines for lighter classes of general construction and bid fair to replace all imported woods of like qualities.[10]

The apitongs (species of *Dipterocarpus* and *Shorea guiso*) will compare favorably with the hard pines and are being used for heavier classes of general construction. The yacals (certain species of *Hopea, Vatica,* and *Shorea*) are hard and durable and are used for general construction work, especially where contact with the ground is necessary. However, the great bulk of the Philippine forests is composed of trees that yield timber of the grades of lauan and apitong. Of the trees other than dipterocarps found in the dipterocarp forest probably one-half of the bulk is composed of woods that would grade with the lauans or apitong. Of these the family *Anacardiaceae* produces *Koordersiodendron pinnatum* (amuguis), *Dracontomelum dao* (dao), *Mangifera altissima* (pahutan); in the *Sapotaceae* are *Illipe ramiflora* and several species of *Palaquium;* in the *Sterculiaceae* are *Tarrietia javanica* (lumbayao) and other species of several genera; in the *Sapindaceae* is *Pometia pinnata* (malugay); in the *Rhamnaceae* are species of *Zizyphus* (balacat); in the *Combretaceae* are several species of *Terminalia,* and in the *Rubiaceae* is *Sarcocephalus cordatus* (bancal).[11]

The prevalent idea that the tropics produce nothing but hardwoods suitable for special uses like the teak for shipbuilding, and the mahoganies and their substitutes, for fine interior finish, furniture and cabinet making, is due, in the Philippines at least, to a number of causes.

1. The wood-destroying forces in the tropics are much greater than in temperate regions. The continual heat and moisture favor the rapid development of fungi, and with the presence of anay (white ants) tend to shorten the duration of untreated timbers in almost every class of construction, consequently hard durable timbers are sought for permanent structures.

2. The cost of extracting such timbers by crude methods (animal and

[10] On account of color and fine figure, when quarter sawn, the best grades of the lauans are valuable for furniture, cabinet making, and fine classes of interior finish, and are used extensively as such.

[11] See Foxworthy, F. W. Philippine Woods, *This Journal* 2 (1907) *Botany* 351–404, and Gardner, R. Mechanical Properties and Uses of Thirty-four Philippine Woods, Bureau of Forestry (Philip.) Bull. 4 (1906) 1–66, for description of the uses and mechanical properties of these woods.

manual labor) is great, but the ruling high prices justify the expense. The cost of extracting the softer woods by the same methods is as great or nearly as great because the logs are usually much larger in size. The price paid for such logs is comparatively low so that the profits, if any, are much lower. The introduction of modern logging machinery will reduce and is reducing the cost of logging greatly.

3. The demand for great amounts of cheap construction timbers is supplied by bamboo stems or palms, and small or young dicotyledonous trees.

4. No widespread attempt has ever been made to place the general construction woods of the tropics on the markets of temperate zones.

It is shown from the above that the volume per acre of the dipterocarp forests of the Philippines is great enough to allow lumbering operations on a large scale, and the supply is sufficient to allow a large per cent for export of the cheaper classes of timber. It is believed that in time such timbers will be exported to temperate regions and sold at a price that will allow them to compete successfully with timber of a like grade. That it is not done at the present time is due to certain unfavorable economic conditions, which will in time be overcome.

The amount of timber in the Philippines is limited, principally because the land area of the Philippines (about 120,000 square miles) is small, with a virgin forest area of approximately 40,000 square miles. What proportion of this will ultimately be absolute forest land, to yield continuous crops of timber is not yet known. Large deforested areas are on non-agricultural land. It is shown that so far as the Philippines are concerned the forests yield mostly general construction timbers, which are as a rule practically unknown to the temperate zone markets of the world. Borneo with an area approximately two and one-half times that of the Philippines is rich in dipterocarps and because of its smaller population probably has a much larger percentage of virgin forest area than the Philippines. There as well as in other parts of the thinly settled Malayan regions, so far as is known, no attempt has been made to take an inventory of the forest resources. In thickly settled Java nearly all of the accessible virgin forest area has been removed. With the exception of *eng* (*Dipterocarpus tuberculatus* Roxb.) and *sál* (*Shorea robusta* Gaertn.), the dipterocarps of Burma and tropical India are little known outside local markets. Concerning the forests of Burma I quote the following from a letter of M. L. Merritt who recently visited a small portion of this region. "Naturally I saw more of the plains and low hill forests than any other. Here teak (*Tectona grandis*) and *pyingado* (*Xylia dolabriformis*) are the two species which they regard as being most valuable. The former is very scattered and I doubt if there will be one-half to one-third trees to the acre. *Pyingado* is more numerous and will run approximately one to three trees per acre. The dipterocarps, *Dipterocarpus alatus* and *Dipterocarpus laevis,* both of which resemble

Dipterocarpus grandiflorus and *Dipterocarpus vernicifluus* in shape of bole, habits of growth and wood as well as fruit, and *Dipterocarpus tuberculatus* occur scattered all through the forest and probably have as large a yield as there is of all other species combined. They are not logged, however, except in the more accessible places. I also noted a *Parashorea* and a *Shorea* in the forest." Foxworthy[12] states that if all woods other than the dipterocarps were excluded from the markets of the tropical East, the markets would hardly feel the difference.

So much for the Asiatic tropics. Will the tropical regions of Africa and South America show similar quantities of general construction timbers in their virgin forest? So far as I know, economic and scientific explorations have been mainly attempts, from the viewpoint of the lumberman, to find valuable hardwoods of the mahogany grade or hard durable timbers. The forests as a whole have not been sized up from the standpoint of the forester with a view to the utilization of all the species. From the results of the investigations given above, made in the Philippines, it is probable that the virgin forests of South America and Africa will show that a greater part of their bulk will consist of woods suitable for general construction purposes of certain classes, which can, with the introduction of modern methods of logging and milling and with improved economic conditions that are sure to come with the development of the tropics, be placed in the markets of the temperate regions at a cost that will enable them to compete with woods of similar qualities found in virgin forests in temperate regions or grown there as successive crops.

In the United States an inventory of the natural resources is being made with a view to conserving them. An attempt is being made to extend this conservation inventory to other parts of the world. So far as the forest resources of the world are concerned I believe that there is no problem that will ultimately yield greater scientific and economic results than an inventory of the forest resources of the tropical world. This will include a mapping of the forested areas, a rough estimate of the standing timber, and a brief description of the areas as regards their lumbering possibilities and the classes of timber found.

Mention was made above (page 701) that increment should be considered as a factor in an estimation of success in forest vegetation. In some forest trees of the Philippines rings of growth occur. In others these are lacking or obscure. It is not known whether these rings are annual or only seasonal. On this account no estimate can be made of the annual increment from rings of growth. Actual measurement of rate of tree growth in the tropics is not extensive enough to be of general application. It is believed, however, that the rate of growth in the tropics is much greater than in temperate zones, that generally speaking the soft wood forest trees will reach maturity in one-half to two-thirds

[12] Foxworthy, F. W. Indo-Malayan Woods. *This Journal* 4 (1909) *Botany* 506.

of the time they require in regions where the climatic conditions inhibit growth entirely for a considerable part of the year. If bulk alone is considered as a measure of success in forest growth, the virgin forests of some parts of the temperate regions are surely more successful than those of the tropics. This is especially true of the northwestern part of the United States where exceedingly heavy stands of coniferous forests occur. But if the annual increment is also used as an element of success it is believed that some tropical regions are capable of producing more bulk per year than temperate regions. Again, this is of economic importance. While the land area of the north temperate zone is much greater than that of the tropics and the absolute forest land (that is land that is better fitted for forest growth than agriculture) is also much greater, this inequality is in a measure offset by the possibility that each acre of land in the tropics can probably produce from one and a half to two crops of timber for one crop in temperate regions. A theoretical discussion of the causes of the shorter lives of tropical trees is reserved for another paper.

I wish to express my thanks to E. D. Merrill, Botanist of the Bureau of Science, for assistance in referring tree species to their scientific names, and especially to H. M. Curran, Forester in the Bureau of Forestry, for valuable suggestions in the preparation of this paper.

ILLUSTRATIONS.

EXPLANATION OF THE PLATES.

PLATE XXXII. A tree of *Dipterocarpus vernicifluus*, (*panao*), showing the form of the bole and crown. Bataan Province, Luzon.

XXXIII. Interior view of a dipterocarp forest on a delta plain in Mindoro showing scattered large trees.

XXXIV. Interior view of a dipterocarp forest in Masbate. The trees are all one species, *Parashorea plicata*, (*bagtican lauan*).

XXXV. Outside view of a dipterocarp forest in Negros, on the lower slopes of Mount Silay. This forest will yield over 30,000 feet per acre, board measure, clear lumber, and consists of an almost pure stand of *apitong* and *lauan*.

XXXVI. Interior view of a dipterocarp forest on the lower slopes of Mount Silay, Negros. The trees are *red lauan* and *almon*, species of *Shorea*.

XXXVII. Interior view of a dipterocarp forest on the slopes of Mount Silay, Negros. The trees are *tanguile*, *almon*, and *red lauan*, all closely related species of *Shorea*.

XXXVIII. Interior view of a dipterocarp forest on the lower slopes of Mount Silay, Negros. The trees are *red lauan* and *almon*, species of *Shorea*.

PLATE XXXII.

PLATE XXXIII.

PLATE XXXIV.

PLATE XXXV.

PLATE XXXVI.

PLATE XXXVII.

PLATE XXXVIII.

ERRATA.

Page 103, line 6 from bottom, for *philippensis*, read *philippica*.
Page 268, line 15 from bottom, for *latisliqua*, read *latisiliqua*.
Page 276, line 8 from bottom, for *Pimelodendron*, read *Pimeleodendron*.
Page 313, for **ALIXIA**, read **ALYXIA**.
Page 332, table, read *Pseudoeugenia*, Malay Peninsula 2; *Aphanomyrtus*, Java 1.
Page 334, line 18 from top, for **verdugonionus**, read **verdugonianus**.
Page 353, line 6 from top, for **phanerophelebia**, read **phanerophlebia**.
Page 354, line 19 from bottom, after from insert being.
Page 359, line 2 from bottom, for *rubrivenia*, read *rubrovenia*.
Page 367, line 5 from top, for *Myrthus*, read *Myrtus*.
Page 374, line 7 from bottom, for aparently, read apparently.
Page 394, line 19 from bottom, instead of for, read from.
Page 395, line 24 from top, for Zetiung, read Zeitung.
Page 403, line 14 from bottom, for CALYPTHANTHES, read CALYPTHRANTHES.
line 5 from bottom, for *Decaspernum*, read *Decaspermum*.
Page 405, line 1, for LINAETA, read LINEATA.
line 7, for *salinga* read *saligna*.
Page 440, add Blits Blits, G. A. Bulletin van het Koloniaal Museum te Haarlem **19** (1898).
Page 606, line 13 from top, for Plate XXX, read Plate XXX bis.
Plate XXII, fig. 11, for *Scarodocarpus*, read *Scorodocarpus*.
Plate XXIV, fig. 34, for *suietenia*, read *swietenia*.
Plate XXV, fig. 38, for *Canaium*, read *Canarium*.
Plate XXVIII, fig. 78, for *Serial*, read *Seriah*.
Plate XXIX, fig. 96, for *Fagraca*, read *Fagraea*.
Plate XXX, fig. 105, for *barnesü*, read *barnesii*.
PLATE XXX.—NORMANBYA MERRILLI BECC., read PLATE XXX BIS.—NORMANBYA MERRILLII BECC.

INDEX.

(New species and new combinations published for the first time are in black-faced type; synonyms and species mentioned incidentally in the text are indicated by the page references being in italics. It is to be noted that nothing included in No. 4, pages 409 to 592, "Indo-Malayan Woods," is indexed here, as that number is separately indexed.)

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